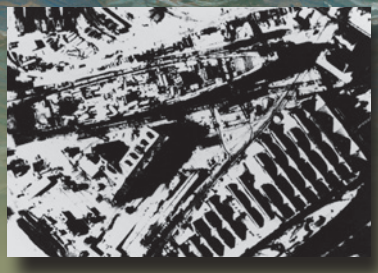
SUPER-BATTLESHIPS OF WORLD WAR II

Montana-class, Lion-class, H-class, A-150 and Sovetsky Soyuz-class



MARK STILLE

ILLUSTRATED BY PAUL WRIGHT

NEW VANGUARD 314

SUPER-BATTLESHIPS OF WORLD WAR II

Montana-class, Lion-class, H-class, A-150 and Sovetsky Soyuz-class

MARK STILLE ILLUSTRATED BY PAUL WRIGHT

CONTENTS

INTRODUCTION 4

BATTLESHIP DESIGN PRACTICES 5

- Protection
- Propulsion
- Firepower

THE SUPER-BATTLESHIP CLASSES 9

- The United States Navy – the Montana-class
- The Royal Navy – the Lion-class
- The *Kriegsmarine* – the H-class
- The Imperial Japanese Navy – Design A-150
- The Soviet Navy – the Sovetsky Soyuz-class

ANALYSIS AND CONCLUSION 44

FURTHER READING 47

INDEX 48

SUPER-BATTLESHIPS OF WORLD WAR II

Montana-class, Lion-class, H-class, A-150 and Sovetsky Soyuz-class

INTRODUCTION

This book will trace the design, development, and eventual fates of the uncompleted super-battleships that the leading naval powers intended to build during the period immediately before and during World War II. None of these ships were actually completed and their designs were in various stages of maturity, but the stories of these leviathans are compelling.

The United States Navy (USN) built ten battleships during the period of World War II but was fearful of the potential threat of the next generation of Axis super-battleships. To counter such a development, the Americans planned to build five Montana-class super-battleships. Compared to the preceding Iowa-class, the Montanas would have been more heavily protected, better armed, but slower. This is the type of battleship the USN preferred to build absent from any restrictions from naval treaties.

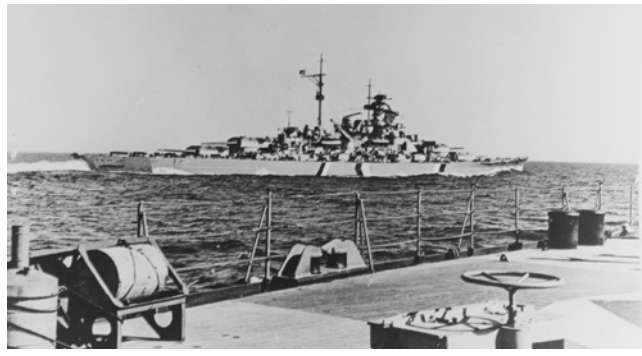
British designers developed plans for an improved version of the King George V-class known as the Lion-class. These would have been the Royal Navy's (RN) counter to a German super-battleship program. Four ships were planned; two were laid down before the war, but all were eventually canceled and scrapped.

Much larger than the Lion-class was the German Navy's H-class. Part of the German Navy's prewar naval expansion under the "Z" Plan, the H-class was actually a series of battleships designs. The first, the H-39-class, was an improved Bismarck-class design. Six ships were planned; two were laid down but were scrapped in late 1941. The rest of the H-class designs existed only on paper. The H-41 design was an H-39 with larger guns. The H-42, H-43, and H-44 battleships were flights of fantasy and had no prospects of

This artist's rendering of a Montana-class battleship underway conveys the raw power of these ships. The painting shows the ship's graceful clipper bow and overall balanced appearance, with two main battery turrets fore and aft. Had the ships been built, they would have carried a full suite of electronics and an immense number of antiaircraft guns, as depicted here. Superior radar and antiaircraft protection were two of the primary advantages enjoyed by USN battleships compared to foreign designs. (Naval History and Heritage Command)

ever being built. The H-44 design was an incredible 141,500 tons fully loaded with 20in. guns.

Not to be left behind, the Soviet Navy also planned a significant naval expansion before the war, built around the Sovetsky Soyuz-class. An incredible 15 ships of this class were planned at one point. If completed, they would have rivaled the Montana-class in size. Such an ambitious program was well beyond the capabilities of Soviet industry at the time, but four were laid down and construction proceeded on three. Construction was halted after the German invasion, and all three were eventually canceled.



Bismarck photographed en route to Norway prior to her Atlantic sortie. On her only combat operation, *Bismarck* was damaged by shells from *Prince of Wales*, then crippled by a torpedo hit on her rudder, until finally being sunk by an avalanche of shells ranging from 8 to 16in. The later versions of the H-class tried to take advantage of this wartime experience, particularly in making another rudder disaster impossible. (Naval History and Heritage Command)

The final class to be considered is the Imperial Japanese Navy's (IJN) contribution to the super-battleship race. They were to be more powerful than any contemporary foreign design in an effort to continue the overmatch against American battleships created by the Yamato-class. Two ships of the class, known as Design A-150, were planned. If completed, they would have carried 20.1in. guns, the largest ever mounted on a battleship. Neither ship was ever laid down.

BATTLESHIP DESIGN PRACTICES

Battleship design is the art of finding the balance between protection, firepower, and speed. Any extra emphasis on any of these areas comes at the expense of the others. Protection was a key attribute, but no ship could carry enough armor to be protected against all types of potential hazards. Typically, battleships were designed to defend against the same size gun that they carried. In addition to carrying enough armor to protect against shellfire, battleships needed a comprehensive underwater protection system to defeat torpedoes and mines. High speed was desired, but the higher the speed, the more machinery was required, and that carried weight penalties. Battleships were most famous for their heavy main batteries, but the larger the gun, the more weight was required for the guns themselves and their associated protection.

Protection

Protection was focused on the armored citadel that enclosed all of the battleship's vital areas. This usually extended from the forward main battery turret to the aft-most main battery turret. Included in this space were the ship's magazines and machinery. Beyond the armored citadel, most navies elected to leave the hull unarmored (the so-called "all or nothing" protection concept); however, the Germans and Russians did not subscribe to this concept. The armored citadel was protected by a main belt to protect the side of the ship from shellfire and horizontal armor to defend against plunging fire from long-range gunnery. Belt armor consisted of a

Iowa, shown here in a photograph from December 1944, was designed for speed and featured a relatively thin hull and powerful machinery. The ship was still heavily protected and carried a powerful main battery of three triple 16in./50 as in this view, but the USN's preference was for a more heavily armed and protected battleship. This was the basis for the Montana-class. (Naval History and Heritage Command)

Immunity zone

A battleship's immunity zone represents the ranges from which enemy plunging fire and direct fire is less effective. Battleship designers sought to give their ships as large an immunity zone as possible. This was also a key tactical factor in engagements between battleships. Shells fired from an enemy battleship at short range travel toward the target at a high velocity on a more or less horizontal trajectory. If they strike the target, they will hit the belt armor at an acute angle or the horizontal armor at an oblique angle. While shells can penetrate even the thickest armor at short range, at some point they will lack the kinetic energy to penetrate armor of a specified thickness.

The heavier the belt armor, the shorter the inner edge of the immunity zone. The outer edge of the immunity zone is the greatest range at which plunging fire fails to penetrate the battleship's horizontal protection. Shells fired at long range travel to the target on a ballistic trajectory and arrive at the target at a steep angle of descent. The more perpendicular they strike the ship's horizontal armor, the greater their penetrative powers. A battleship with heavier horizontal armor will have a longer immunity zone. The distance between these two ranges, measured in yards, is the battleship's immunity zone. For example, the USN's Montana-class had an immunity zone of 18,000–32,000yds against the shells fired from a 16in./50 gun.

main belt usually situated at and above the waterline. Some designs placed the belt internally and inclined it, which increased its effective thickness. Below the main belt was a lower belt designed to defeat shells falling short of the ship but still moving through the water with enough velocity to penetrate the hull. This belt was tapered on its lower part due to the slowing effect water had on shells. Supplementing the side belt was the torpedo bulkhead mounted behind the torpedo blister or the side protection system. The armored citadel was protected at each end by armored bulkheads.

Horizontal protection against long-range plunging shellfire was increasingly important as the power of bombs dropped from aircraft increased. Horizontal armor usually extended for the same length as the armored citadel. Steering equipment was outside the armored citadel and received special protection. Horizontal armor was usually arranged in several different decks. The uppermost deck, called the bomb deck, was thick enough to activate the fuses of shells or bombs. The main armored deck was the thickest and was designed to protect against the effects of an explosion on the bomb deck or the direct impact of a shell or bomb. The deepest layer of horizontal protection was the splinter deck. It was just thick enough to prevent splinters that penetrated the main armored deck from reaching vital areas.

Two types of armor were used on battleships. Face hardened (also known as cemented) armor underwent special treatment to create a hard face and a ductile back. This armor was designed to break up a shell upon impact while the ductile part of the plate prevented it from shattering. Critical areas like the main belt, turret faces, conning towers, and barbettes were the most likely to receive face hardened armor. Homogenous armor was uniform, and thus relied on its ductility and the ability to spread the energy of an impacting shell over a larger area. This type of armor was used in horizontal armor and side protection systems where elasticity was important.

Most of the ship above the main belt was not armored. The exceptions were areas related to weapons and command and control. The main battery turrets were especially well protected with extremely heavy face armor as well as heavy armor on the top, sides, and rear of the turret. The area from the magazine leading into the turret was called the barbette; this area was also extremely well protected. Any area where shells and powder were present was given the highest level of protection. Otherwise, a hit in this area could set off the powder or shells and create a catastrophe. The secondary battery was provided with a much less robust level of protection, usually sufficient

OPPOSITE

The 18.1in. guns carried aboard the Yamato-class were the largest ever fitted to a warship. Here, *Yamato* is pictured in the late stages of fitting out at Kure Naval Base, on September 20, 1941. The carrier on the right is *Hosho* and the store ship *Mamiya* is in the background. Note *Yamato*'s Number 3 18.1in. turret which weighed 2,560 tons. The 20.1in. turret on Design A-150 was calculated to weigh even more – an amazing 2,780 tons. Much of this would have been from the 31.5in. frontal armor and the 11.6in. of top armor. (Naval History and Heritage Command)

against fragmentation damage from the explosion of a main battery shell or from the impact of a secondary battery shell. The final area of dedicated protection above the main belt was the conning tower. This was a vital area since the ship's command staff and any embarked staff fought the ship from this protected area during a surface engagement.

Most likely to cause crippling damage to a battleship was underwater damage. The entire side of the hull was too large to be covered by the armored belt, so the lower part of the hull (within the armored citadel) was provided with a side protection system to defeat torpedo (and to a lesser extent mine) damage. Usually, this system consisted of two parts. A blister was fitted outside the hull to explode a torpedo as far from the hull as possible. The disadvantage of a torpedo blister was that it increased the ship's beam (possibly limiting its access to repair facilities) and adversely affected speed. The second part of the system was a series of compartments built into the hull. These were filled with liquids or left void to absorb the explosive energy of a torpedo. A torpedo bulkhead was usually fitted behind the compartments. Some battleships received a dedicated protection scheme on their underbottom. This was similar to the side protection system with up to three layers, some filled with liquids and some left void. Extensive compartmentation was also used to minimize damage and flooding of a hit in this area. Underbottom protection was a weakness on most battleships, but the chances of a hit in this area were considered to be low.

This 25in.-thick armor plate, on display at the Washington Navy Yard today, was intended for the unfinished Yamato-class battleship *Shinano*. Following the war, it was subjected to tests from projectiles fired from a USN 16in./50 gun. Fired from close range, the plate was easily penetrated, as evinced here. There are many variables at play in determining how much armor a given round will penetrate, but the difficulty in protecting a warship from large naval shells is clear in this view. (Naval History and Heritage Command)

Propulsion

Propulsion systems are a critical design component because so much of the internal space of a battleship is devoted to it. Typically, this can amount to approximately one-third of internal volume once boilers, main machinery, and all associated equipment has been fitted. The greater the volume devoted to machinery, the greater hull area that must be protected. The weight of the machinery and the armor designed to protect it greatly affects the ship's overall displacement. Excessive volume and weight allocated to the propulsive system meant there was less weight available for protection or firepower. Efficiency of the machinery was therefore a critical component of the design since it was often more compact and lighter.

The USN led the way in developing high-efficiency machinery since it embraced high-pressure boilers operating at high temperatures. This translated into high power output with lighter machinery, thus saving weight and offering greater steaming radius. All navies operated some type of steam turbine that took the steam generated by the boilers and turned it into rotating energy for transmission to the shafts. The Germans were ahead in diesel power plants and proposed to use them for the H-class, but this never came to fruition. The main benefit of diesel power was increased range.

This view of *Iowa* in 1945 shows the ship's Number 3 16in./50 turret. *Iowa* is actually in the process of refueling from an oiler whose stack is in the right foreground. *Iowa* carried three of these turrets. The Montana-class added a fourth 15in./50 turret, making them the most heavily armed USN battleships ever planned. The weight of a broadside salvo from the 12 16in. guns would have been 32,400lb. No other battleship could match this firepower. (Naval History and Heritage Command)

Firepower

The main purpose of battleships was to carry a main battery of huge naval rifles. All of the super-battleships covered in this book were designed to carry at least 16in. guns, and the IJN went well beyond this to maintain an ability to outrange its potential enemies. Guns were measured by their diameter (for example, 16in.) and by their length (a 16in./50 gun had a length 50 times its diameter). The larger the gun, the larger the shell it could fire. The heavier the shell, the more stable it was in flight, which translated into greater velocity retention and ultimately greater accuracy. They could also carry larger explosive charges. Barrel length was also important since the longer the barrel, the greater the muzzle velocity. Armor penetration involves many factors, but some of the primary ones were shell diameter, weight, and muzzle velocity.

The guns planned for the super-battleships in this book are detailed in the table below. All of these were powerful weapons with a rate of fire of one to two rounds per minute. The USN's Mark 8 Armor Piercing, Capped shells weighed 2,700lb and with a muzzle velocity of 2,500ft per second possessed formidable penetrative powers. At 20,000yds, they could penetrate 20in. of vertical steel armor. These were deployed aboard the Iowa-class and would have been on the Montana-class had they been completed. To demonstrate the importance of shell weight, in comparison the RN's Mark II 16in./45 gun, firing a 2,375lb shell, could penetrate only 15.3in. of vertical armor at 20,000yds, and 3.2in. of horizontal armor at the same range.

Super-battleship main guns

System	Shell size	Muzzle velocity	Maximum range	Fitted on
16in./50	2,700lb	2,500ft per second	43,345yds	Montana-class
16in./45 Mark II	2,375lb	2,450ft per second	43,800yds	Lion-class
16in./50	2,271lb	2,657ft per second	40,250yds	H-39-class
16in./50 B-37	2,443lb	2,700ft per second	49,900yds	Sovetsky Soyuz-class
20.1in./45	4,290lb	Unknown	Unknown	Design A-150

Just as important as gun performance was the ability of its supporting fire control system to actually hit a target. Generating consistently accurate fire control solutions is difficult even with the complex fire control systems carried aboard battleships. Since battleships usually engaged their opposites at long range to reduce their vulnerability to return fire, hits were rare. The basis for long-range fire was a rangefinder to determine the range to the target. Accurate fire required that this range be constantly updated and predicted with regard to the firing ship's own position. It was critical to track the fall of your own shell splashes and then correct the fire solution accordingly. This complex calculation was done by an analog computer that calculated a fire control solution using inputs from all parts of the fire control system. By late in the war, when the super-battleships in this book would have entered service, rangefinders were replaced by radar in some navies. Radar essentially acted as a much more accurate rangefinder. The USN made the greatest use of radar and had the best equipment. The Mark 8 S-band radar

could track targets and friendly shell splashes, and could track a battleship-sized target at 40,000yds. Radar provided battleships a blind-fire capability so they could accurately engage targets at night and in poor visibility conditions. The RN also used radar-directed gunnery, but the Japanese, German, and Soviet navies were far behind in this regard.

Bismarck and *Tirpitz* carried a main battery of eight 15in. guns. This view of *Tirpitz* leading a battle group out of a Norwegian fjord shows her two aft 15in. gun turrets. By moving to a 16in. gun on the H-39-class, the Germans went from a 15in. gun with a shell weight of 1,764lb to a shell weighing 2,271lb with correspondingly greater penetration. If they had adopted a triple turret for their battleship main battery, gun weight would have been saved but they preferred to stick with twin turrets. (Naval History and Heritage Command)

THE SUPER-BATTLESHIP CLASSES

The United States Navy – the Montana-class

Origins

The 15 older USN battleships in service at the start of the war were consistent in that their designs stressed firepower and protection over speed. The latest of these ships carried 12 14in. guns or eight 16in. guns, and were as well protected as any foreign adversary from the period. This came at the price of reduced speed (only 20–21kts), slower than their foreign contemporaries. After a 14-year hiatus, the USN laid down a new battleship in 1937. Working within the limitations of the Second London Naval Treaty, it was 35,000 tons standard displacement and carried a main battery of nine 16in. guns. Advancement in machinery allowed for a top speed of 28kts. The tonnage limit meant that compromises had to be made in the area of protection. The next class, named after the lead ship *South Dakota*, was laid down in 1939. Four ships were built using this design. It marked a return to the USN's traditional emphasis on protection – in this case able to withstand 16in. shellfire. Even within the 35,000-ton limit, American designers were also able to mount a main battery of nine 16in./45 guns and provide machinery able to propel the ship at 27.5kts. The South Dakota-class was probably the best treaty battleship produced by any navy.

Only one USN battleship-class was constructed mostly free of treaty restrictions. This was the Iowa-class, which was the largest and most powerful class of battleships ever built by the USN. The four ships of this class represented a new approach for American designers. The new class stressed speed. Because the design displaced over 48,000 tons, the Iowa-class still maintained high levels of firepower and protection.

The Montana-class represented a return to the traditional USN approach that emphasized firepower and protection over speed. With this perspective, it is clear that the Iowa-class with its emphasis on speed was a unique case and not something that the USN wanted to continue. The first two Iowa-class ships (given the hull numbers BB 61 and BB 62) were part of the Fiscal Year (FY) 40 program. In mid-1939, it was assumed that the FY 41 program would include two more Iowa-class ships (BB 63 and BB 64). In FY 42, it appeared that the USN would revert to a slower, more conventional, battleship design. Had this occurred, it would have taken the hull number BB 65 – the design work on the Montana-class went forward labeled as variations of BB 65. (In fact, two more *Iowas*, *Illinois* (BB 65) and *Kentucky* (BB 66), were laid down but were never completed. The Montana-class was then given hull numbers beginning with BB 67.)

The designers for the Montana-class were given virtually no limitation on tonnage. Even with this luxury, they still found it difficult to fit

This model, dating from 1940–41, shows the preliminary design of a Montana-class battleship. The basic configuration looks much like an Iowa-class battleship with its long bow, compact forward superstructure, and two stacks. The model clearly shows that radar was a part of the design from its early stages. The secondary battery is shown but none of the antiaircraft guns were included. (Naval History and Heritage Command)

everything they wanted on a hull with a reasonable displacement. The single-most important factor was the desire to fit a main battery of 12 16in./50 guns able to fire the new 2,700lb heavy shells. Since standard USN practice was to provide its battleships with protection sufficient to defeat a shell the same size carried by the ship itself, USN designers had to find a way to protect against its own 2,700lb shell. This was the primary factor driving the size and displacement of the Montana-class.

Operating under the assumption that BB 65 would not be a repeat of the Iowa-class, the General Board (responsible for issuing requirements and then approving ship designs) instructed the Bureau of Construction and Repair (C&R – later merged in 1940 with the Bureau of Engineering to form the Bureau of Ships) in mid-1939 to begin work on a 45,000-ton battleship capable of 27kts carrying 12 16in. guns, and protected against the 2,700lb 16in. shell. The designers at C&R had already gone through this exercise in 1938. In a series of different design schemes, and with the allotted displacement, protection could only be provided against a 2,250lb shell. To achieve the same immunity zone as the Iowa-class (18,000–30,000yds), it was estimated that displacement would rise to between 50,000–55,000 tons.

The restriction of a 45,000-ton hull (resulting from the escalator clause in the Second London Naval Treaty that allowed an increase from the prevailing 35,000-ton limit to 45,000 tons if a foreign power breached the lower limit) was removed in the next round of design work beginning in October 1939. The General Board asked for two studies for a ship carrying a main battery of 12 16in. guns, a secondary battery of about 20 5in./38 guns, and protection against the 16in. heavy shells with an immunity zone between 18,000–30,000yds. One design was for a ship with a top speed of 27.5kts and the other for a much faster ship capable of 32.5kts. The results of the design studies indicated that the slower ship could be built on a hull displacing 51,400 tons; this went up to 53,400 tons if the new 5in./54 guns were used for the secondary battery instead of the 5in./38s. The faster version would be enormous – 1,000ft in length and 63,500 tons standard displacement.

A subsequent round of design work in February proceeded with the General Board requesting five more studies all with drafts restricted to 36ft. Much of the design work depended on existing designs, like using the propulsion system from the South Dakota and Iowa-classes.

A

***MONTANA* IN ACTION**

In this fictional scene, *Montana* engages an unseen IJN battleship. The ship's 12 16in. guns are trained to port and elevated in preparation to fire a salvo. As highlighted in the fictional Battle of Honshu in the text, an American commander with a Montana-class super-battleship under his command against an IJN surface force would probably have selected to fight the battle at long range to take advantage of *Montana*'s superior fire control system. By keeping the battle at long range, *Montana* could still hit a target accurately while the Japanese, lacking a real fire-control radar, could not.

66

The ships varied in length between 840 and 1,000ft, with the best protected having an immunity zone from 18,000 to 32,000yds. Further design studies followed until every possible variant of heavily protected 27.5kt ships, not-as-well-protected 33kt, and everything in between was produced by June 1940.

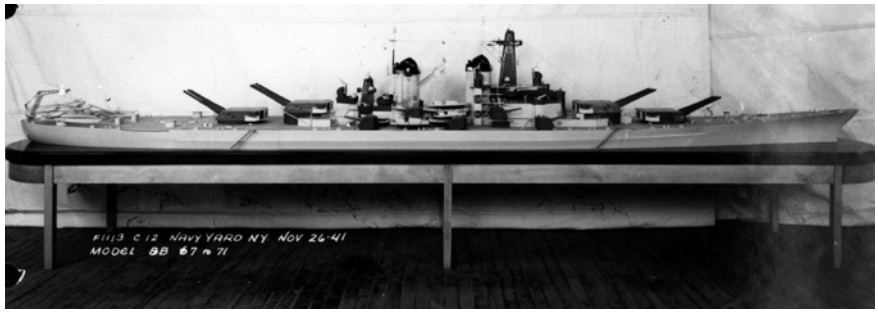
Design work was overcome by real-world events. The fall of France in June 1940 brought Congress to pass a huge naval expansion bill known as the Two-Ocean Navy Act. To get new ships authorized, design work had to be frozen. The General Board had decided on a design known as BB 65-5A, which was one of the heavily armored but slower variants with a displacement of 57,500 tons, a main battery of 12 16in. guns, an immunity zone of 18,000–32,000yds, and a top speed of 28kts. The Secretary of the Navy approved the design on August 19, 1940. This was not the final step in the process, since this approval did not mean approval for actual construction. This allowed further refinement of the design to continue until construction began. Subsequent modifications included a reduction in length to 890ft and improvements in protection. Not until June 1941 was the final design settled on.

Protection

The Bureau of Ordnance considered the USN's 16in./50 gun to be the best of its kind, so it became the basis for designing the Montana-class's protection package. The USN did not understand that the IJN's Yamato-class carried 18.1in. guns and that the Japanese planned to mount even larger guns on their next class of battleship. The 16in./50 gun fired the heavy 2,700lb gun and had a muzzle velocity of 2,500ft per second. To keep an immunity zone of 18,000–32,000yds, calculations indicated the main belt had to be 16.1in. thick and the deck armor 5.8in. thick.

Accordingly, the Montana-class had a main belt 16.1in. thick with an internal slope of 19 degrees making it equivalent to 21in. of vertical armor. Horizontal protection consisted of three parts: the bomb deck, the main armor deck, and the splinter deck. In its heaviest areas (over the magazines), this totaled almost 10in. of protection.

Underwater protection was given a heavy emphasis since the power of aircraft-launched torpedoes had already been demonstrated during the war. Side protection consisted of four compartments to absorb the energy from a torpedo or mine. The two outboard compartments were filled with liquids and the two inner compartments were left as voids. Underbottom protection consisted of a triple bottom extending the entire length of the armored citadel. The side protection system and the extreme compartmentation



This more detailed model of a Montana-class battleship was photographed at the New York Navy Yard on November 26, 1941. Some of the differences from an Iowa-class battleship are evident: the addition of a fourth 16in. gun turret aft, the placement of the secondary battery one deck lower to increase stability, and the boat stowage amidships. Had the ships been built, it is likely the area devoted to boat stowage would have been used instead for additional antiaircraft guns. (Naval History and Heritage Command)

was designed to provide the highest level of underwater protection from underwater damage ever fitted to a USN battleship. Specifics on the protection of the Montana-class are provided below.

Montana-class armor	
Belt	16.1in. (backed by 40lb steel plating –approx. 25lb equals 1in.) to 10.2in. (sloped at 19 degrees); lower belt 8.5–2.75in.; internal belt of 30lb steel
Bulkheads	18in. forward, 15.25in. rear
Horizontal armor	Bomb deck 2in. steel; armor deck 6.2in. on 50lb plating (7.4in. over magazines); splinter deck 25lb steel
Turret barbettes	21.3in. frontal (tapering down to 7.75in.), 18in. rear
Main battery turrets	18in. frontal, 7.75in. top, 10in. side, 12in. rear
Conning tower	18in. tapering down to 7.4in.

Propulsion

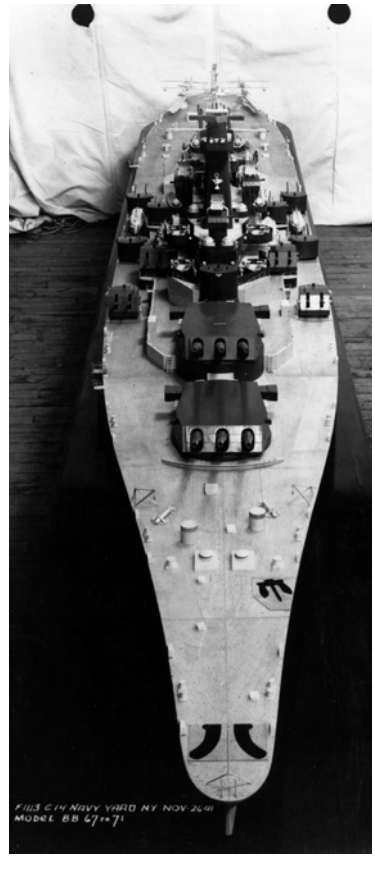
The machinery intended for the Montana-class was designed to develop 172,000 shaft horsepower (shp). This was less than the 212,000shp fitted aboard the Iowa-class but was still able to drive the ships at a top speed of 28kts. The internal arrangement placed the boilers outboard of the turbines to save space and weight, and to increase compartmentation. This machinery arrangement emphasized subdivision and isolation of the various components, but it had the adverse effect of arranging the machinery in two groups. This was a sound approach since it made the system flexible and increased resistance to battle damage but was undermined in this circumstance since boilers in one group could not supply steam to turbines in the other group. The 28kt top speed would have been adequate for a fleet engagement, but it was marginal for carrier task operations, which is what the Montana-class would have ended up doing had they been completed.

Armament

A driving factor of the Montana-class design was the imperative to carry the 16in./50 gun. In the early designs, various combinations of twin, triple, and quadruple gun turrets were considered, rendering a main battery of between nine and 12 guns. The final design called for a main battery of four triple turrets, two forward and two aft. The broadside of these 12 guns totaled 32,400lb. This was the largest ever planned for a USN battleship and was greater than that of the Yamato-class.

The General Board briefly considered the use of an 18in. gun on the new battleship class but decided to stick with the 16in. gun. The primary reason for this seems to have been the fact that 18in. guns would have resulted in a main battery of only six guns if displacement was kept at around 45,000 tons.

A powerful secondary battery was an important consideration since it had to have the range and hitting power to deal with the IJN's larger destroyers. The USN hoped to mount the 6in./47 dual-purpose gun, but this gun experienced development delays and was not ready until after the war. The USN was forced to revert to the 5in. dual-purpose gun, but the Montana-class was slated to

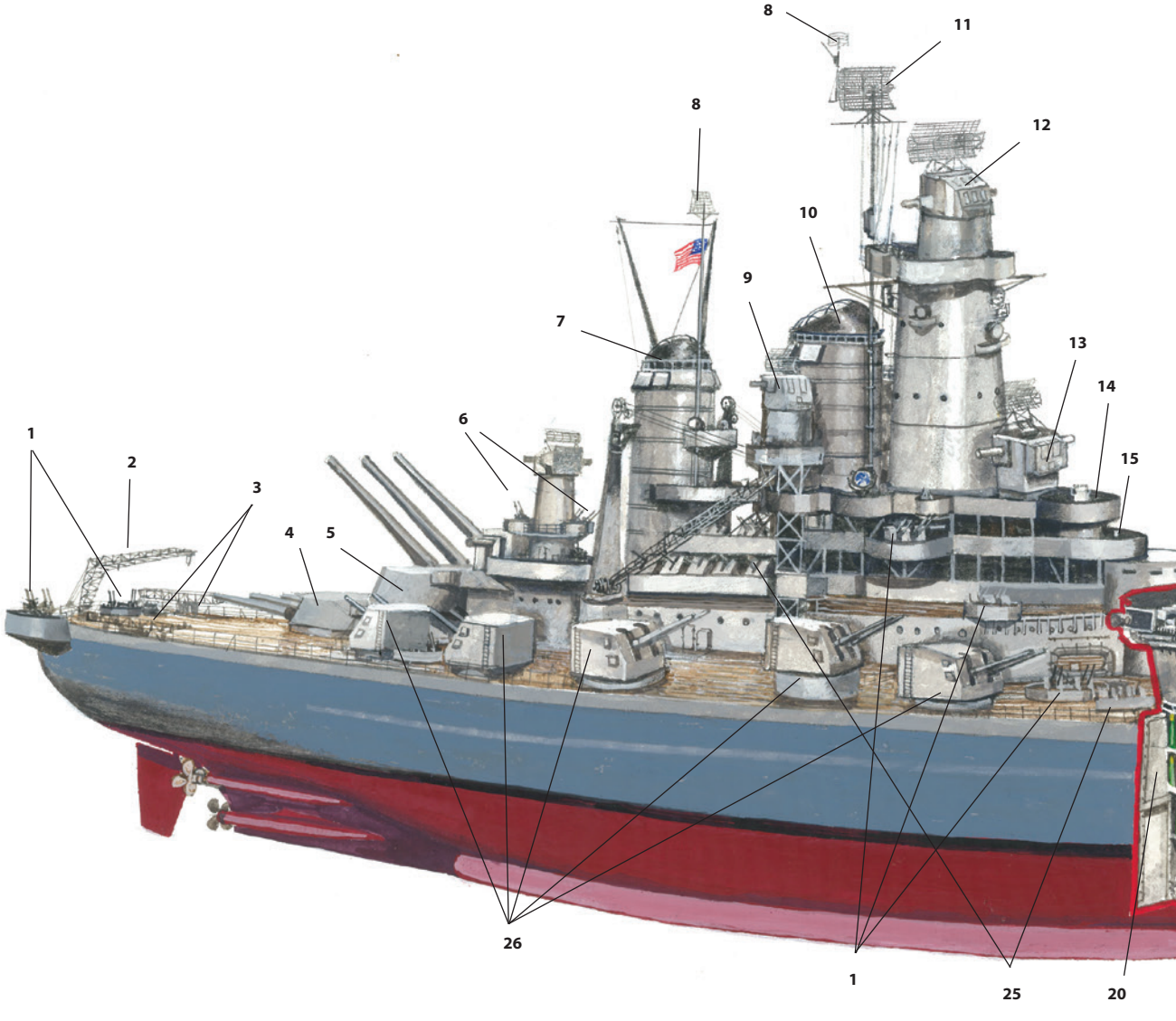


The same model photographed from the bow. This view shows the beam of these ships – they were the first USN battleships designed from the onset without the ability to use the Panama Canal. Note the mine paravanes on the deck forward of the 16in. turrets. Behind the turrets is the heavily armored conning tower. The forward section of the ship offered open deck space with clear arcs of fire and would have been covered by 40mm and 20mm gun mounts had the ships been built. (Naval History and Heritage Command)

B

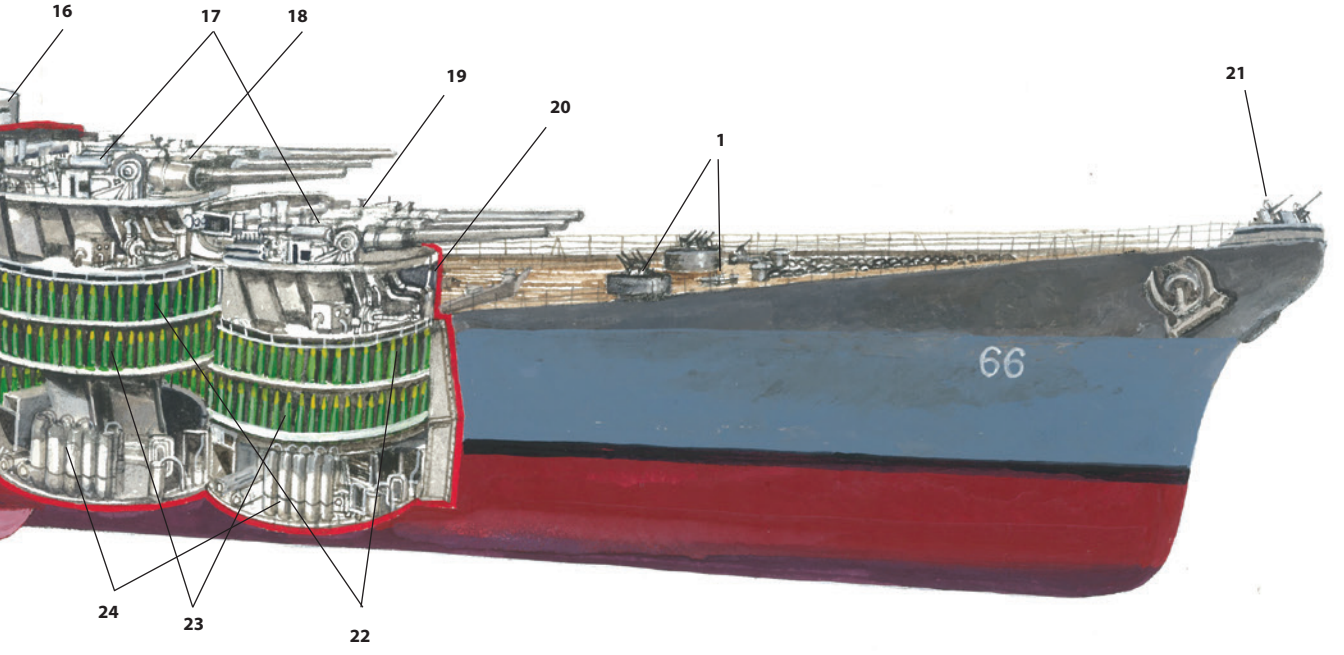
USS *MONTANA*

Montana would have been the lead ship of five had construction on the class been completed. With her combination of firepower and speed, *Montana* would have been the most powerful USN battleship ever commissioned. She is depicted in the late war Measure 21 (1945 revision) scheme.



KEY

1. 40mm quad gun mount
2. Aircraft crane
3. Aircraft catapult
4. Number 4 16in. gun turret
5. Number 3 16in. gun turret
6. 40mm quad gun mount
7. Aft stack
8. SG surface search radar
9. Mark 37 director for secondary battery with Mark 12 radar
10. Forward stack
11. SK-2 air search radar
12. Mark 38 director for main battery with Mark 8 radar
13. Mark 37 director for secondary battery with Mark 12 radar
14. Navigation bridge
15. Flag bridge
16. Conning tower
17. Armored gun house
18. Number 2 16in. gun turret (with same features as Number 1 turret)
19. Number 1 16in. gun turret
20. Barbette
21. 20mm single gun mount
22. Upper shell handling room
23. Lower shell handing room
24. Powder handling room
25. 20mm single gun mount
26. 5in./54 twin gun mount



This photograph shows the model's stern view of a Montana-class battleship. Aviation facilities are clearly visible, including a large aircraft crane, two rotating catapults, and stowage for three or four aircraft. Lacking on the model is any depiction of the possible placement of antiaircraft guns. The scale of antiaircraft protection for all USN ships at this time was deficient; after the USN entered the war, ships were provided with as many antiaircraft guns as they could carry. For the Montana-class, this would have almost certainly included two 40mm quad mounts on the stern, two more on the quarterdeck, and another on top of the Number 3 16in. gun turret. In addition, a large number of single 20mm mounts would have been placed on the aft deck area. (Naval History and Heritage Command)

carry the improved 5in./54 gun in ten twin turrets instead of the reliable but range-limited 5in./38 carried on the Iowa-class. The new 5in./54 gun fired a 70lb shell out to a maximum of 25,900yds.

Since the Montana-class was designed before the USN's active participation in the war, antiaircraft protection was inadequate. This was the case with other USN ships of the period, but this weakness was alleviated as the designs matured. In the case of the Montana-class, it is unclear what its final antiaircraft configuration would have been. As usual for USN ships of the period, adding more antiaircraft mounts was difficult since the extra topweight affected stability. The Montana-class was originally designed with only six 1.1in. quadruple machine cannons. These were replaced by 40mm quadruple mounts in January 1941. The final version of the design in June 1942 raised the number of 40mm mounts to ten. Had the ships ever been built, it is almost certain that the number of 40mm mounts would have risen dramatically, perhaps to as many as 24. The effectiveness of the 40mm mounts against air attacks would have forced the designers to compensate for the extra weight of the mounts with other weight-saving measures. For example, reducing the top armor on the 16in. turrets was proposed.

There were a large number of 20mm single mounts since they needed no external source or power and could be mounted anywhere with a clear arc of fire. The original design called for 20 single mounts. Had the ships been built, this would have been increased dramatically. As many as 54 were proposed.

As was the case on USN battleships, space was provided for aviation facilities to handle floatplanes used primarily for gunnery spotting. Two catapults were located on the stern to launch the floatplane, with a single crane to hoist them back aboard. Space was adequate to store three or four aircraft. By the time these ships would have been commissioned, the floatplane carried would have been the Curtiss SC Seahawk. During the war, floatplanes were rarely used for their intended purpose of gunnery spotting since this was better performed by radar (unless the ship was performing naval gunfire support).

Fate

What would have been the USN's largest and most powerful battleships were authorized as part of the Two-Ocean Navy Act of July 19, 1940. It was envisioned that the ships would be completed between July and November 1945. They were given names and hull numbers as indicated below:

Planned Montana-class construction

Name	Hull number	Built by
Montana	BB 67	Philadelphia Navy Yard
Ohio	BB 68	Philadelphia Navy Yard
Maine	BB 69	New York Navy Yard
New Hampshire	BB 70	New York Navy Yard
Louisiana	BB 71	Norfolk Navy Yard

None of the ships were ever laid down. This was because of two reasons – industrial shortages (primarily a shortage of steel) and a higher priority (championed by President Roosevelt) for aircraft carriers. Despite efforts by the General Board to resurrect the Montana-class, they were canceled on July 21, 1943.

Montana-class specifications (as designed)	
Displacement	60,500 tons standard; 70,500 tons full load
Dimensions	Length 925ft; beam 121ft, 2in.; draft 36ft, 10in. at full displacement
Machinery	Eight boilers driving four geared steam turbines on four shafts making 172,000shp
Performance	28kts
Range	7,500 tons of fuel for 15,000nm at 15kts
Crew	2,247 (2,789 as task force flagship)

The Royal Navy – the Lion-class

Origins

British naval designers had been forced to make a number of compromises on the King George V-class, so the RN was intent on completing a new class of battleships to rectify the weaknesses identified on the preceding class. There were many factors at work that made the King George V-class less than satisfactory. Among these were a lack of experienced ship design staff, and shortages in armor and guns. The biggest reason for the ships' shortcomings was a need for economy and a strict adherence to the 35,000-ton limit for battleship construction then in effect. Whatever compromises had to be made were necessary to get the ships started in 1937 so the lead ships could be launched by 1939. Though the ships rendered sterling wartime service, the King George V battleships were the worst design of any of the 35,000-ton treaty battleships.

The loss of *Prince of Wales* on December 10, 1941 to Japanese torpedo bombers was a shock to the RN and demonstrated that the underwater protection of the King George V-class was deficient. Though the torpedo protection system was designed to handle explosions of 1,000lb of TNT, it was defeated by Japanese air-launched torpedoes with warheads less than half that amount. As bad as the torpedo protection system proved to be, the rest of the protection package performed well. It must also be kept in mind that British armor was excellent and was about 25% more resistant to damage than comparable USN armor.

King George V ships were also badly underarmed compared with their foreign contemporaries. After a series of bad decisions, the main battery was set at ten 14in. guns arranged in three turrets – two quadruple and one twin. In addition, the new 14in. quadruple turrets experienced severe teething problems. The compromise to mount 14in. guns instead of 16in. guns was necessary since it resulted in the earlier completion of the ships at a time when new battleships were very badly needed.

Another issue with the King George V-class was its poor endurance. Driving this problem

The King George V-class served as the design basis for the Lion-class. As such, the two classes would have looked very similar had the Lions ever been built. This is *Prince of Wales* in 1941. The primary difference between the two classes would have been the *Lion*'s main battery of 16in. guns in triple turrets as opposed to *Prince of Wales*' 14in. main battery in quadruple and twin turrets. (Naval History and Heritage Command)

Howe, one of the RN's King George V-class battleships, passes through the Suez Canal in 1944 en route to join the British Eastern Fleet. With her wartime camouflage, full electronics, and antiaircraft suites, this is a close approximation of how a Lion-class ship would have looked late in the war, with the exception of the triple 16in. turrets replacing the *Howe*'s 14in. main battery. (Naval History and Heritage Command)

was the inefficiency of the Parsons turbines. *Duke of York*'s range in 1944 was calculated as 5,600nm at 10kts. This was problematic in the Atlantic and proved even more of an issue when the RN began large-scale operations in the Pacific.

As soon as construction began on the first two King George V units in 1937, design work began in mid-1937 on a new class of battleships. By this point, the Japanese refusal to sign the London Naval Treaty brought the limit on main battery guns from 14 to 16in. However, the 35,000-ton limit was still in effect, and British designers were having difficulties producing a balanced design on that tonnage. Relief was provided by the Admiralty's decision to invoke the escalator clause in the 1936 London Naval Treaty that increased the allowed standard displacement limit to 45,000 tons. Even so, the RN decided to limit the new class to 40,000 tons. This act of restraint was not reciprocated by the other naval powers then in the process of designing their new super-battleships. In February 1938, the Admiralty issued the design specification for the new class. These were set as a main battery of nine 16in. guns, a secondary battery of 16 5.25in. dual-purpose guns, side armor sufficient to defeat a 16in. shell from 14,000yds, horizontal armor adequate to protect against a 1,000lb bomb dropped from 15,000ft or a 16in. shell from 30,000yds, and torpedo protection against a 1,000lb warhead. The top speed of these heavily armed and protected ships was to be 30kts. Preliminary design work began in early 1938. It was quickly apparent that to meet the Admiralty's specifications, a displacement of at least 39,500 tons was required.

Moving quickly, the Admiralty approved a design in May 1938. By increasing the standard displacement from 39,500 to 40,750 tons, the secondary battery was increased to 16 5.25in. guns, slightly more powerful machinery was added, and the main belt given a uniform thickness. The modified design was produced in June 1938. By December, the contract design was completed.

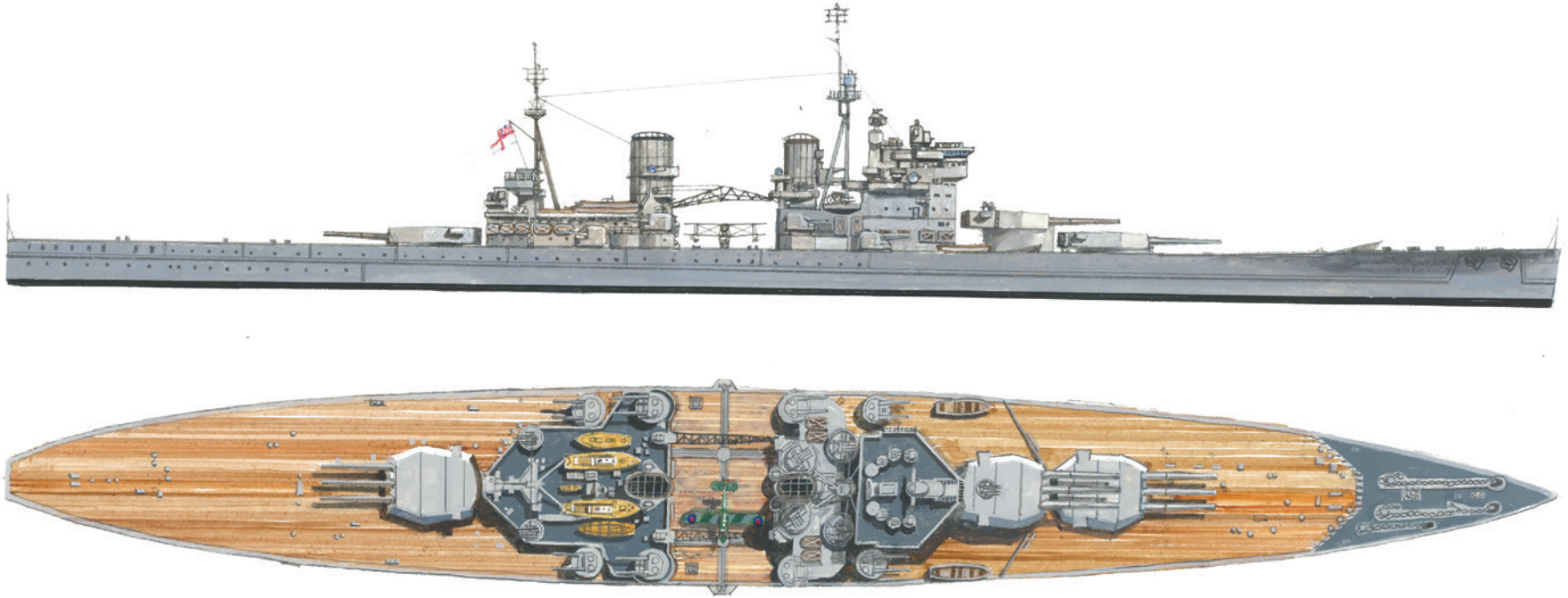
Protection

Protection for the Lion-class was the heaviest ever planned for a RN battleship. The main belt was designed to withstand 16in. shellfire with an immunity zone of 19,000–30,625yds over the magazines and 22,000–27,250yds for

C

THE LION-CLASS

These overhead and profile views depict a Lion-class super-battleship in its original 1938 design. The ship is remarkably similar to the preceding King George V-class. Both classes shared the same superstructure and stack arrangement. As first designed, the Lion-class had a straight stem and virtually no sheer to its bow. In 1942, this was changed and a sheer added to enhance seaworthiness. Note also the amidships aircraft facilities with two fixed catapults mounted athwartships. The main battery was comprised of three triple turrets, each with three 16in./45 guns. The secondary battery was identical in numbers and placement to the King George V-class. The location of the eight twin 5.25in. turrets is clear in the overhead view. In 1938, the antiaircraft battery was almost an afterthought. Only six octuple pom-pom mounts were originally included. The 1942 redesign addressed this weakness by eliminating the aviation facilities amidships. This provided the necessary space for three more octuple pom-pom mounts and a quad mount. Had any of the ships been completed, they would have carried many 20mm single guns.



the machinery spaces. Maximum thickness was 14.71in., and the belt was 15ft wide. The main belt began to taper 6in. below the waterline. The lower belt covered 8.25ft below the main belt and tapered to 5.2in. It extended 40ft beyond each armored bulkhead for a total length of 510ft.

Horizontal protection was designed to defeat a 1,000lb armor-piercing bomb dropped from 15,000ft. This was accomplished with a main armor deck of 5.9in. over the magazines and 4.9in. over the machinery spaces. Magazines also received another layer of between 1.5–2in. Horizontal protection extended forward and aft of the armored bulkheads; 4.4in. were in place over the steering room and shafts aft. The idea was that this extended armored deck would explode bombs before they penetrated and caused more damage to the spaces below.

Side protection was designed to protect against the explosion of a 1,000lb charge of TNT. The system was like that fitted on King George V ships but with additional depth. Maximum depth was 14.3ft at the area of B turret; it was only 11ft forward and 13ft aft. Two void spaces were placed between the outer hull and the inner torpedo bulkhead, which was 2.5in. thick. Additional depth was desired, but this was impossible because of the restrictions posed by existing drydocks. Bottom protection was an issue since it was composed of a double bottom only 4ft deep. The British calculated that no amount of bottom protection would prevent significant internal damage against a well-placed blast.

Lion-class armor	
Belt	14.7in.
Bulkheads	11.8in.
Horizontal armor	5.9in. over the magazines, 4.9in. over machinery spaces
Turret barbettes	14.7in. on the sides
Main battery turrets	14.7in. frontal, 5.9in. top, 9.8in. side, 6.9in. rear
Conning tower	4.3in. on the sides (designed to protect against 5in. shells)

Propulsion

Eight three-drum, small-type Admiralty boilers drove four Parsons-type turbines to power four shafts. Normal propulsive power totaled 120,000shp, which was sufficient to drive the ship at 28.25kts at full displacement. However, the system was designed to operate with the boilers in an overload condition raising power to 130,000shp. This would have resulted in a top speed of 28.75kts at full displacement. Boiler and engine rooms were separated so that a single hit would not cripple the ship's propulsive power.

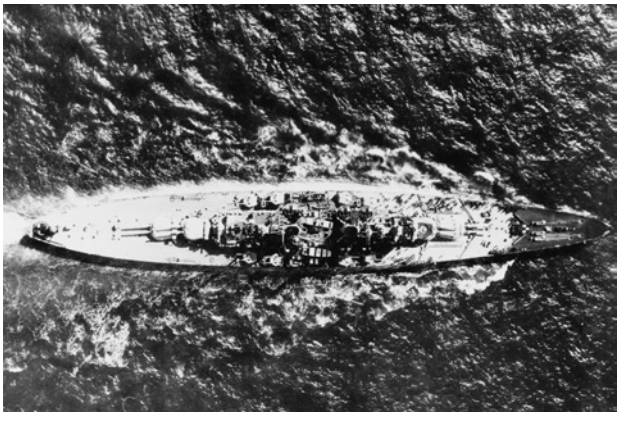
Armament

The main battery of the Lion-class consisted of nine 16in./45 guns placed in three triple turrets arranged two forward and one aft. The characteristics of this gun have been described earlier. The Mark II guns designed and built for the Lion-class were much improved from the Mark I 16in. guns fitted on the RN's Nelson-class battleships built in the 1920s.

After the 1942 redesign, the secondary battery was set at 16 5.25in./50 guns in eight twin turrets. The guns were arranged in the same configuration as on the King George V-class. The 5.25in./50 was a proven weapon having

been fitted to many RN ships. It was a dual-purpose gun that could throw an 80lb shell out to a maximum range of 23,400yds.

War experience demonstrated the need to augment the antiaircraft defenses of RN warships. The original design for the Lion-class had room for only six Mark VI octuple pom-pom mounts. The Naval Staff wanted eight octuple pom-pom mounts, but it proved impossible to find eight positions free from the blast of the main and secondary battery. The 1942 redesign eliminated the aviation facilities amidships. This provided space for three more Mark VI mounts and a quad Mark VII mount. It is likely that the pom-poms would have been replaced by the superior quad 40mm mount had the ships been completed. In addition, many 20mm single guns would also have been fitted.



Vanguard, pictured here directly overhead, was some 30ft longer than *Lion* and possessed a slightly greater beam. She was an improvement to the King George V-class but would have been inferior to the Lion-class had they been built. This view shows the configuration of her 5.25in. secondary battery and the transom stern, both features shared with the Lion-class. (Naval History and Heritage Command)

Fate

Following the final approval of the design on December 15, 1938, the Admiralty quickly sought bids. Contracts were awarded on February 21, 1939. The short period from final design approval to awarding contracts demonstrated the pressing need to get the ships started as soon as possible. Contracts for the first two ships were awarded on February 21, 1939, and they were ordered a week later. It was hoped that they could be completed in three and a half years. This plan was quickly derailed by a lack of labor and armor. In October 1939, construction was suspended for a year and the ships left on the way in hope of work being resumed. Work on *Conqueror* and *Thunderer* was never begun.

Planned Lion-class construction

Name	Laid down	Built by
Lion	July 4, 1939	Vickers-Armstrong, Newcastle
Temeraire	June 1, 1939	Cammell Laird, Birkenhead
Conqueror	Never	John Brown & Company, Clydebank
Thunderer	Never	Fairfield Shipbuilding and Engineering Company, Glasgow

The slow pace of construction allowed refinement of the design to continue. War experience needed to be incorporated into the new ships, and in November it was decided to further delay construction. However, doubts about the value of battleships increasingly made their construction seem unlikely. Despite the low likelihood of work being resumed, the potential of their completion was kept alive as a counter to any Axis battleship construction. In December 1941 and January 1942, more design work was performed to eliminate weaknesses in light of wartime experience. The redesign resulted in improvements in endurance and to the side protection system by increasing the beam to 108ft. The requirement that the most forward main battery turret be able to engage targets straight ahead by firing at zero-degree elevation was lifted. This allowed the freeboard at the bow to increase from 28.3ft to 37ft. The improved bow enhanced seakeeping, which was a problem on the King George V ships. The redesign also added

The RN did complete a battleship after the King George V-class, but it was not a Lion-class ship. *Vanguard* was completed after the war and provides another hint at what the Lion-class would have looked like. This port bow view of *Vanguard* is from 1946. In particular, note the raised bow on *Vanguard*, which was added to the Lion-class after the 1942 redesign. The primary difference between her and the uncompleted Lions would have been the different main battery configuration. *Vanguard* was fitted with four twin 15in. turrets; *Lion* would have had three triple 16in. turrets. Both ships had the same secondary battery of eight twin 5.25in. mounts. (Naval History and Heritage Command)

more close-in antiaircraft weapons, gave their crews splinter protection, fitted additional radar, and modified the electrical plant to prevent a loss of power like that which had crippled *Prince of Wales* when she was sunk on December 10, 1941.

Even after the redesign, work never resumed on *Lion* and *Temeraire*. The Naval Staff concluded that the RN had enough battleships with the completion of the last two King George V ships and in 1943 postponed the completion of the two ships in favor of an extensive program of carrier construction. It was obvious that there was no chance the ships could be completed before the end of the war. By May 1945, the incomplete keels of *Lion* and *Temeraire* were taken off the ways.

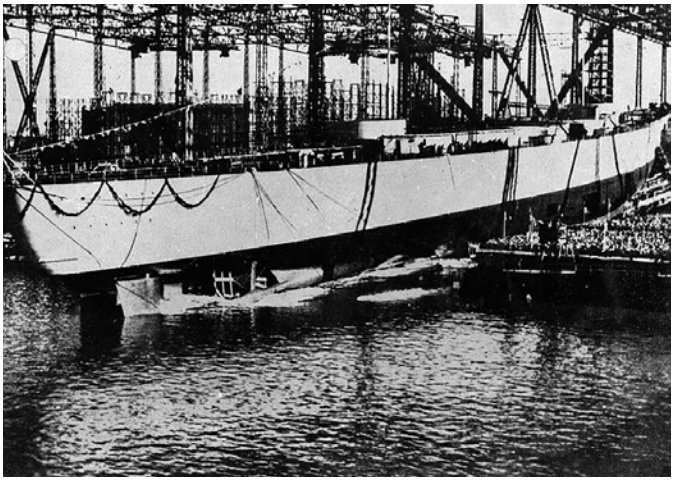
Lion-class specifications (as modified in 1942)	
Displacement	42,550 tons standard; 47,650 tons full load
Dimensions	Length 793ft; beam 108ft; draft 34ft, 3in. at full displacement
Machinery	Eight boilers driving four geared steam turbines on four shafts making 120,000shp (130,000shp forced)
Performance	28.25kts
Range	3,720 tons of fuel oil for 14,000nm at 10kts
Crew	1,750

The *Kriegsmarine* – the H-class

Origins

Facing numerical inferiority against the RN, German battleship designers were faced with the requirement to make their ships faster, better protected, and better armed than their potential British adversaries. The first result of this policy of producing superior ships was the Bismarck-class – the heaviest battleships ever built by a European navy. Preliminary design work on what became the Bismarck-class began in 1934. The final result was a ship with a full-load displacement of just over 49,000 tons, a top speed of 30kts, a main battery of eight 15in. guns mounted in four twin turrets, and a main belt with a maximum thickness of 12.6in. *Bismarck* and her sister ship *Tirpitz* demonstrated they were fine battleships, but in their next effort German designers were determined to create an even more powerful ship.

Studies for the new class of battleships began in 1937 with the primary desire being to increase the size of the main battery. Early on, Hitler injected himself into the design process and urged that each ship be given main battery guns greater than those carried by any potential enemy. This was a simplistic view since it failed to consider the other corresponding requirements that mounting huge guns brought. After being convinced that ships with immense displacements were not practical for Germany, Hitler agreed that a 16in. gun was the maximum practical size. Aside from the upgrade to a 16in. main battery, the early design requirements were very similar to the Bismarck-class.

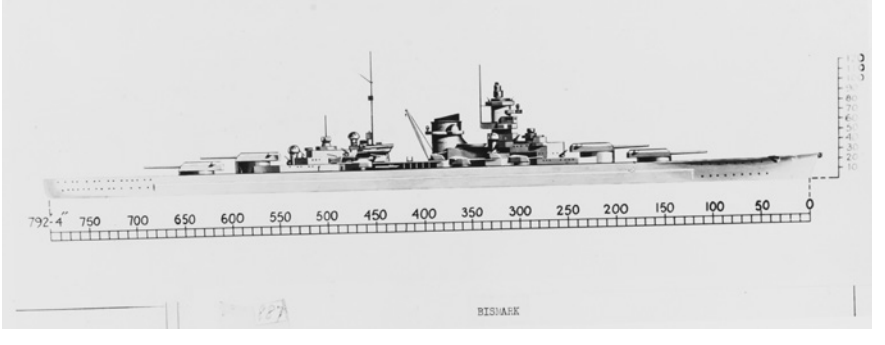


Bismarck pictured here sliding down the launching ways at the Blohm + Voss shipyard on February 14, 1939. She was later joined by her sister ship *Tirpitz*. The *Kriegsmarine* planned even bigger things with the six super-battleships of the H-class. In the tradition of German naval designers, *Bismarck* stressed protection over other areas. (Naval History and Heritage Command)

As part of the "Z" Plan for German naval expansion, it was agreed that six of the new battleships, called the H-class, would be constructed by 1944. The design process for these ships was long and tortured, reflecting the meddling of Hitler and changing wartime requirements. In spring 1939, plans for the new ships were showing progress with the final design being concluded in July. Hitler was impatient to get construction started, so Battleship "H" was laid down on July 15, 1939.

Completion of the H-class in six years was predicated on the assumption that the German Navy would not be called to fight until 1946. Immediately after the start of the war on September 1, 1939, work was stopped on the first two ships that had been laid down. Competing requirements for steel meant that construction would never be resumed. The H-class program was doomed.

Postponement on H-class construction allowed the Germans to refine the design with the benefit of wartime experience. Following Hitler's orders to look into a new design, the navy concluded a new study on July 15, 1940. This was the basis for the H-40 design, which focused on protection improvements. Two design alternatives were actually proposed. The first (Scheme A) kept the original displacement by removing one of the main battery turrets to provide weight for the desired extra protection. To increase the power to maintain the original design's 30kt speed, a major redesign would have been required to accommodate a fourth shaft and



This USN line drawing of *Bismarck* shows the primary features of this class. The main battery of four twin 15in. turrets is evident, as is the compact superstructure and single stack. Despite the external similarities of the two classes, the H-39 class featured important differences like its propulsion system of 12 diesel engines and an upgraded main battery of eight 26in. guns. (Naval History and Heritage Command)

additional diesels. To avoid this, a new propulsion system with a mixed diesel and steam turbine system was proposed. Scheme B kept the original main battery intact and added additional protection at the cost of more displacement. To maintain speed, the same four-shaft, mixed propulsion system was planned.

The H-40 design was discarded when Hitler directed that no construction on the first two ships would happen until after the war. This led to the next design, H-41, which represented an attempt to improve protection even further and accept whatever speed impact was created by the extra weight. Most of the additional weight, bringing the hull-load displacement to 77,752 tons, was put into increasing horizontal protection. The upper armor deck was ultimately increased to 3.2in. and the lower armor deck to 5.9in. in thickness. Anti-torpedo defenses were also improved with the objective of withstanding a warhead of 500lb. Outside of a 1.8in. torpedo bulkhead, there were three longitudinal zones, two left void and one filled with liquid. The maximum depth of the system was 22ft. Underbottom protection was also emphasized with total thickness of steel with a total depth of almost 10ft. Another modification from wartime experiences, in this case the loss of *Bismarck* in May 1941, added an explosive charge in the rudder posts in case it was necessary to blow the rudder away as a result of battle damage.

The H-41 design was completely different to the original H-39 design and was approved on November 15, 1941. Had construction resumed after the war on the H-class, it would have been to this design.

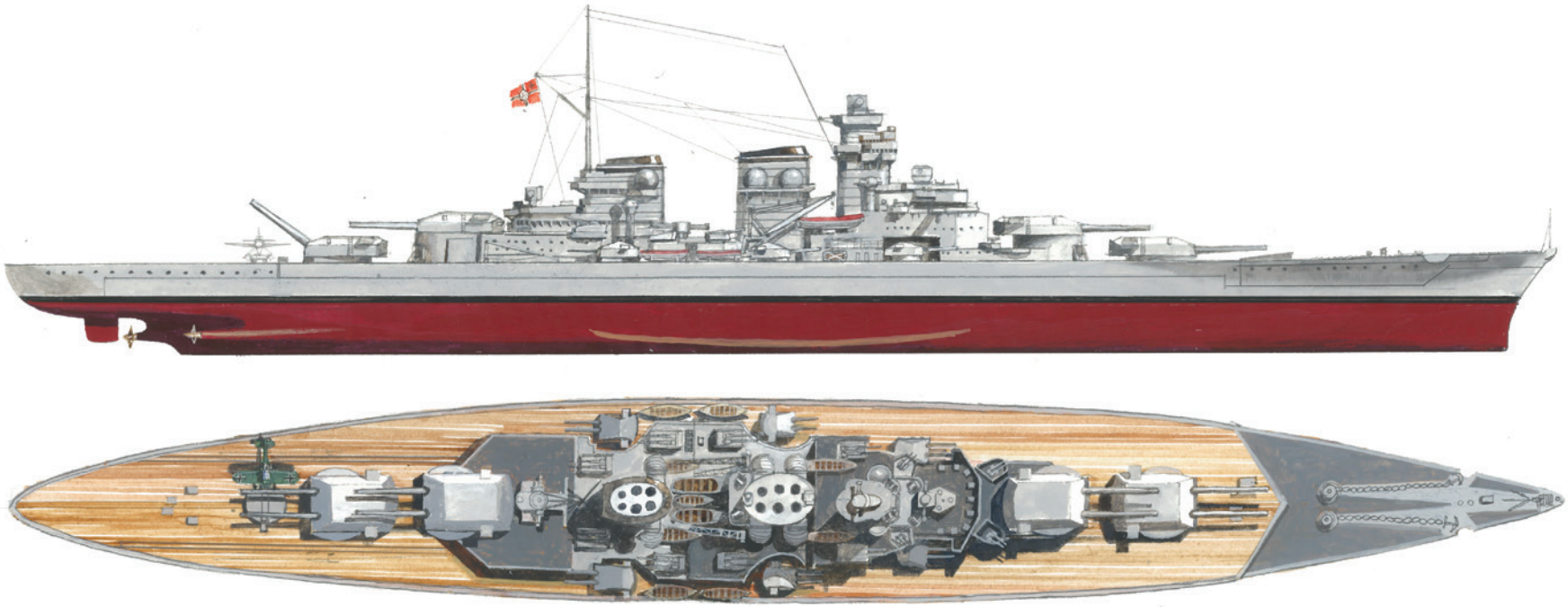
Another important difference with the H-41 design was a change in the main battery. To maintain an edge over a RN super-battleship armed with 16in. guns, the H-41 design featured a new 16.5in./48 gun. The ship retained an eight-gun main battery, and all other armament remained the same. This major design change was possible because the original 16in. gun barrels were oversized, making it possible to realign them to 16.54in. None of the existing 16in. barrels were ever modified in this manner, but ammunition tests were carried out. Using special powder and a sub-caliber shell, the Germans hoped to gain extra range.

After the addition of displacement from the original H-39 design and an increase in the beam to give additional depth to the side protection system, speed dropped to 28kts. German designers decided to come down from the original 30kt requirement for the sake of additional protection. Endurance remained an important consideration, which required that fuel oil capacity be increased to keep the range at 20,000nm.

D

THE H-CLASS

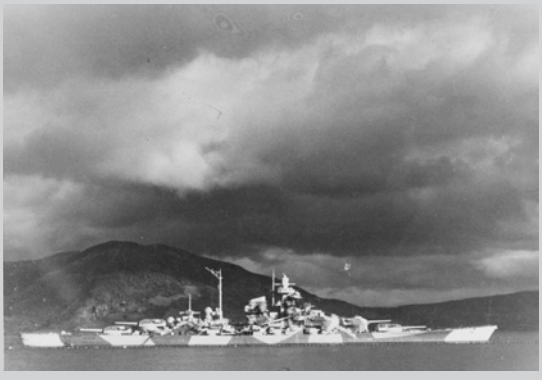
These views depict a German H-class super-battleship. The ship shown is the H-39 design, which could have entered service as soon as 1944 had Hitler not started the war in 1939. H-39-class ships would have displayed a great likeness to the Bismarck-class. They would have had a balanced and powerful appearance with two forward and two aft 16in./50 turrets and two massive stacks for its 12 diesel engines. The secondary and antiaircraft batteries are also in evidence and are very similar to the *Bismarck*'s in number and placement. These include twelve 5.9in./55 guns in six twin turrets placed on the main deck and the long-range antiaircraft battery of 16 4.1in./65 guns (in eight enclosed mounts) placed one level up. An array of smaller antiaircraft guns is visible, including 16 37mm/83 guns in twin mounts. Aside from the two massive stacks, the other primary external difference from the *Bismarck* was the movement of the aviation facilities from the amidships position to an awkward position aft. Note the catapult directly under the Number 4 16in. turret; the entrance to the aircraft hangars is abreast Turret Number 3.



The last German battleship designs

Hitler was fascinated with large weapons of war and directed the navy to continue to investigate large battleship designs. These were purely theoretical exercises, conducted by the New Ship Design Commission instead of the Construction Office, which had created earlier battleship designs. They were flights of fancy with no limitations on gun size or displacement. There was no chance they would be built; adequate steel would never have been available for these monstrosities.

The designs show the continuing German emphasis on firepower and protection. All were much larger than the H-41 design, both in terms of length and beam. Wartime damage to *Bismarck* and *Tirpitz* was considered and led to significant enhancements in protection. The immense beams of these ships, growing to 169ft in the H-44 design, were due to the increase in the depth of the torpedo defense system.



Following *Bismarck*'s loss, the Germans sent *Tirpitz* (shown here) to Norway, where she presented a residual threat to Allied convoys to the Soviet Union. While in Norway, she was attacked by British midget submarines and a series of carrier air attacks until being sunk by heavy bombers carrying 12,000lb bombs. Later H-class designs made use of this experience by increasing underbottom and horizontal protection, but the Germans realized there was no way of providing protection against a 12,000lb projectile dropped from altitude. (Naval History and Heritage Command)

The tremendous depth of the side protection system was matched by an increase in the depth of the underbottom protection – over 15ft in the case of the H-44 design.

The main battery grew in size to 20in. guns on the last two designs. The secondary batteries remained essentially unchanged from the H-39 design.

Given their massive size, the designers could also find room to fit a propulsion system capable of generating 266,300shp. A mixed plant was again used, comprised of four diesels on the outer shafts and two steam turbines on the inner two shafts. Even with the great displacement of these ships, all could make at least 30kts.

Characteristics of the German theoretical battleship designs

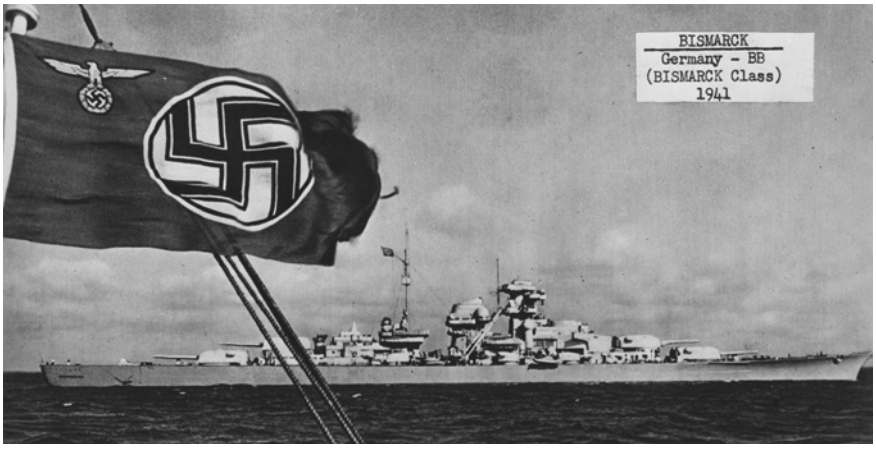
Design	H-42	H-43	H-44
Displacement (full load in tons)	96,451	118,104	139,264
Length (feet)	1,000	1,082	1,133
Beam (feet)	140	158	169
Main belt (inches)	15	15	15
Horizontal protection (inches)	13	13	13
Depth of side protection system (feet)	25.1	31.2	36.1
Main battery guns	8 x 16.5in.	8 x 20in.	8 x 20in.
Maximum speed (overload)	32kts	31kts	30kts
Range (at 19kts)	20,000nm	20,000nm	20,000nm

With no chance that any of these designs would ever be built, these were nothing more than conceptual studies. By this point in the war, it was clear that investments in battleships, however "unsinkable," were not wise. The concept that they could still be used on long-range patrols into the Atlantic was sheer fantasy. Aside from this, they were impractical since they were too big to be built on any existing launching way (they would have had to have been built in a dry dock), and they could not have operated from the shallow German ports in the North Sea. H-44 was too big to have entered any German port.

Protection

Overall weight devoted to armor was 39.2% of standard displacement. In some areas, like the main belt, there was actually less protection than on the preceding Bismarck-class. In other areas, like the bow and stern, and around the steering equipment, protection was greater.

The immunity zone of the H-39-class against the USN's 16in/./45 gun firing a 2,240lb shell was calculated to be between 13,500–25,000yds. Arrangement of the armor on the H-39 was similar to that on the Bismarck-class. Placement and thickness of the vertical side armor was not designed to provide total protection against shell penetration but to minimize damage to vital areas. The main (lower) armor belt was less than 12in. thick (actually



Bismarck was a balanced design, but in the eyes of German designers was weak in firepower. Given the extra tonnage for the H-39 design, the Germans decided to keep the basic protection package used for *Bismarck* and add firepower enhancements in the form of a 16in. main battery. Because the Germans envisioned their capital ships being used as commerce raiders, a mission requiring extensive range, the H-39-class used diesel propulsion for greater endurance. (Naval History and Heritage Command)

less than that fitted on *Bismarck*) and was fairly shallow. In general, most of the hull was vulnerable to penetration by large shells.

H-39-class armor	
Belt	Lower 11.8in., upper 5.9in.
Bulkheads	Maximum 8.7in.
Horizontal armor	Total 9.1in. over the magazines (outboard), 6.7in. over machinery spaces (spaces)
Turret barbettes	14.4in.
Main battery turrets	15.6in. frontal, 8.7in. top, 8.7in. side, 12.8in. rear
Conning tower	13.8in.

Horizontal protection was based on an upper deck and an armor deck. Extra armor was placed over the machinery spaces and the magazine, with the outboard portions of the armor deck sloped to provide additional protection.

There was extensive placement of armor on the bow and stern areas outside the armored citadel based on an examination of World War I actions. Armor on the bow protected the forward fuel tanks, and stern armor protected the steering gear. The Germans thought that unarmored hull areas could be seriously damaged by shell splinters and that it would be easier to contend with damage confined to a smaller part of the ship. German designers held to the belief that conning towers (main and secondary) were critical areas that had to be heavily protected. The heaviest protection was devoted to the main turrets and their barbettes.

Side protection featured a torpedo bulkhead 1.8in. outside the machinery spaces and 2.4in. outside the magazine. Thickness of the anti-torpedo defenses was 18ft amidships but obviously declined fore and aft as the hull narrowed. German designers were only able to provide a 4.2ft standoff in the area of the aft 16in. turret. Underbottom protection was provided by a double bottom with extensive subdivision. The depth of the system was increased to a maximum of 9ft under the main turrets.

Propulsion

One of the biggest changes from *Bismarck* was the propulsion system for the H-class. This change was driven by the type of operations that the H-class would be required to conduct. In a war against the United Kingdom, the Germans

still planned to use their capital ships as long-range surface raiders against British commerce. This required a ship with the greatest possible endurance. To achieve this, diesels were preferred since they were more economical than steam propulsion plants. Adopting diesel propulsion also promised the advantage of immediate emergency response, something a steam plant could not do. Original design requirements called for an endurance of 16,000nm at 19kts. Twelve diesels and 12 diesel generators were required to generate the necessary 162,743shp for the three shafts. Top speed was just over 30kts.

A downside of the diesel plant was that it took up more internal volume than a comparable steam plant. This was a factor when the Germans wanted to add additional secondary guns but found internal space for magazines was not available. It was impossible to have a single stack for the 12 diesel engines, so two stacks were necessary. This further reduced the deck space for guns and necessitated the relocation of the aviation facilities aft.

Armament

Usually, testing and production of large guns is the lengthiest element of completing a battleship. For the H-39 and H-40 designs, the gun of choice was the 16in./50. This gun had been under development since 1934 and by 1940 had completed testing. By 1939, only seven barrels were complete. These were used for coastal defense in Norway and France after the H-class battleships were canceled.

The main battery was to be mounted in four twin turrets. The German Navy did not favor triple or quadruple turrets for its battleship main battery. Twin turrets provided a more effective salvo grouping and reduced the number of guns placed out of action if a turret was knocked out. However, selection of four twin turrets meant the portion of the ship that required protection was extended.

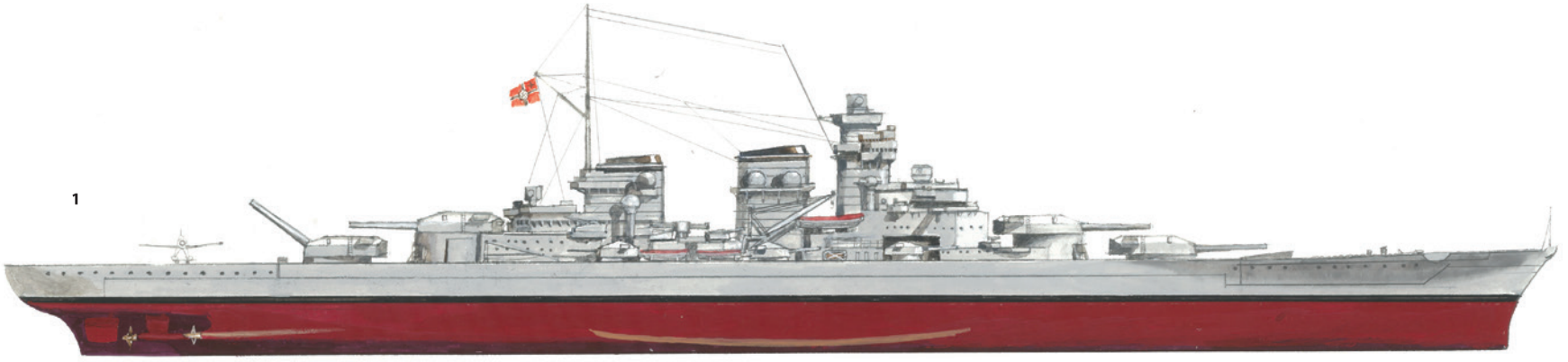
The secondary battery was an archaic mix of several sizes. This was similar to the arrangement found on the Bismarck-class. No additional guns could be fitted because of the unavailability of magazine space and because of the lack of firing arcs for more gun mounts. The secondary battery for engaging surface targets was comprised of 12 5.9in./55 guns in six twin turrets. Sixteen 4.1in./65 dual-purpose guns were also planned;

E

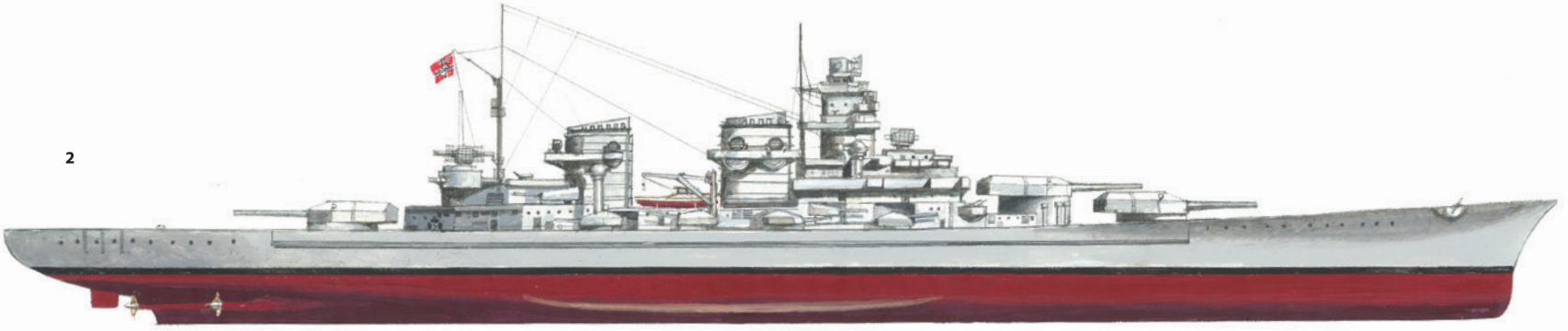
THE OTHER GERMAN SUPER-BATTLESHIP DESIGNS

1. H-41. Had the Germans resumed construction of a super-battleship after the war, it would have been built to this design. The H-41 design differed from the original H-39 design primarily in regard to protection. These improvements focused on enhancing horizontal and underbottom protection by taking advantage of war experience. The main battery was altered to a new 16.5in./48 gun. Otherwise, the class's armament remained unchanged. The only real external difference from the H-39 design was an alteration in the arrangement of the aviation facilities. The H-41 design removed the rotating catapult from under the aft pair of 16.5in. guns and replaced it with a fixed athwartships catapult further aft.

2. H-42. This variant exhibited significant growth in length, beam, and overall tonnage. The armament remained the same, so the extra tonnage was used to fit a more powerful mixed propulsion system and additional protection. Horizontal protection was again a focus; deck armor thickness increased to 13in. over three decks. The Germans identified torpedoes as the principal threat to their super-battleships so made additional efforts to provide better side protection. Accordingly, H-41's beam increased to 140ft, of which 50ft was devoted to the multi-bulkhead torpedo defense system.



1



2

these used an improved fully enclosed mount. The light antiaircraft battery included 16 37mm/83in. twin mounts and 32 20mm single mounts. War experience demonstrated the weakness of German battleship antiaircraft capabilities, and the H-39-class did nothing to improve them. Six underwater 21in. torpedo tubes were also envisioned, primarily in support of their surface raider role.

H-class ships on independent missions required their own aviation capabilities. The aviation facilities for four floatplanes and their associated catapults and hangars space had to be moved from an amidships position as on *Bismarck* to a position in the aft end of the superstructure. This solution was problematical. Hangars, with their flammable contents, were placed on either side of "C" turret with rails leading down to a rotating catapult located directly under the guns of "D" turret. The catapult was unusable unless the guns were trained to one of the beams or moved to maximum elevation. The H-41 design alleviated this situation somewhat by moving the catapult from under the aft pair of 15in. guns and replacing the rotating catapult with a fixed athwartships' catapult.

Fate

Hitler was fully supportive of immense battleships from a national prestige standpoint, but he also saw a need for them in a pending war with the United Kingdom and France. To prepare for such a war, the head of the German Navy prepared a program for naval expansion. Labeled the "Z" Plan, it was presented to Hitler in January 1939 and was built around six "H"-class battleships.

Hitler demanded that the six H-class ships be completed in six years. To ensure this was accomplished, he gave the navy the highest priority to get the program completed by 1944. Four yards were assigned production contracts.

Planned H-39-class construction

Name	Laid down	Built by
Battleship "H"	July 15, 1939	Blohm + Voss, Hamburg
Battleship "J"	September 15, 1939	Deschimag, Bremen
Battleship "K"	Never	Deutsche Werke, Kiel
Battleship "L"	Never	Wilhelmshaven Navy Yard
Battleship "M"	Never	Blohm + Voss, Hamburg
Battleship "N"	Never	Deschimag, Bremen

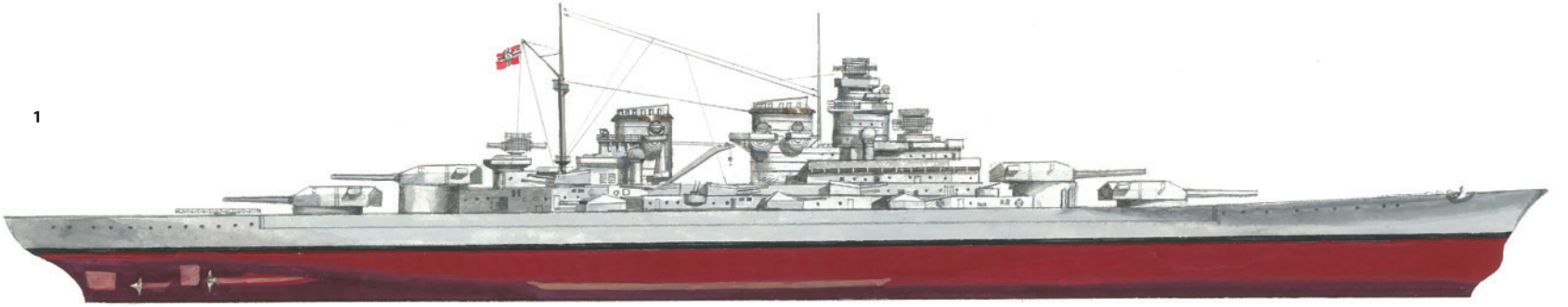
F

THE LAST GERMAN SUPER-BATTLESHIP DESIGNS

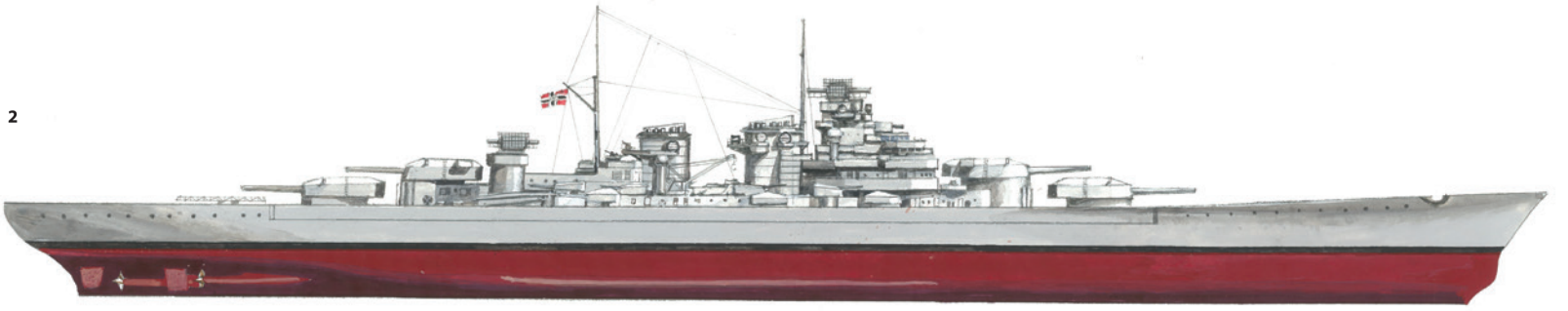
1. H-43. This design was even larger. Increase in the beam was the primary factor in driving full-load displacement to over 118,000 tons. The main battery was increased to eight 20in. guns, which further drove up displacement. Otherwise, the armament remained the same. The mixed propulsion system was retained, but the ship's additional weight translated into a drop in speed. Also affecting speed was the increased beam, which was increased to 158ft with 62ft allocated to the side protection system.

2. H-44. With a totally impractical 139,000 tons full-load displacement, significant additions were possible to the design's protection. Beam increased to 169ft, thus allowing total depth of the side protection system to reach 72ft. The two torpedo bulkheads were increased in thickness, and they extended from the keel to the main deck. The mixed propulsion system and the 20in. main battery were retained.

1



2



Only two ships were laid down. Battleship "H" was begun before the start of the war but was halted after the war began after only 766 tons had been installed. On November 25, 1941, the ship was ordered scrapped and the steel used for other wartime needs. Battleship "J" was begun immediately after the start of the war, but only 40 tons of material had been installed before construction was suspended. She too was ordered scrapped in November 1941. Construction on Battleship "K" was never begun though some 3,000 tons had been delivered to the yard in Kiel. The final three ships never got beyond mere projections.

H-39-class specifications	
Displacement	57,617 tons design; 62,592 tons full load
Dimensions	Length 911ft; beam 121ft, 4in.; draft 36ft, 6in. at full displacement
Machinery	12 diesels on three shafts making 162,743shp
Performance	30.4kts
Range	9,548 tons of diesel oil for 16,000nm at 19kts
Crew	Approximately 2,600

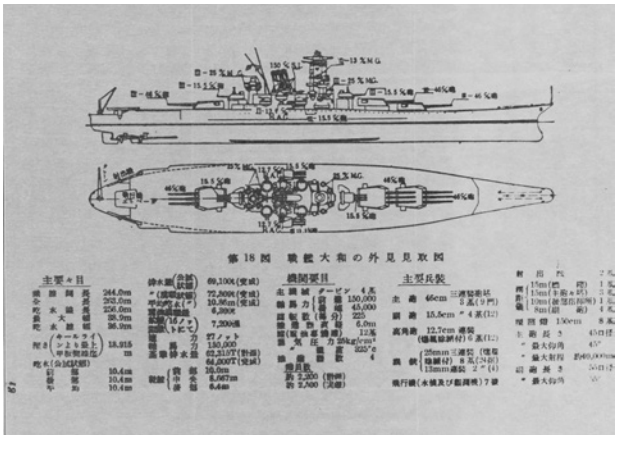
The Imperial Japanese Navy – Design A-150

Origins

Though most plans for the Yamato-class were destroyed before the formal Japanese surrender, some survived, like the one shown here. Nothing survived for Design A-150, which has left details of the super-battleship sparse. Given that the new class was supposedly the same size and displacement as *Yamato*, it is likely that Design A-150 would have borne a close resemblance to the IJN's first super-battleships instead of being a total redesign. (Naval History and Heritage Command)

Of all the unfinished battleships in this book, the IJN's Design A-150 was the furthest from completion. There was no chance any of these ships would ever be started, much less completed. Little is known about the details of this design since all plans were destroyed in the period between Japan accepting the Allied terms of surrender on August 15 and the actual surrender on September 2, 1945. It is not even clear if the design was a "Super Yamato" or something entirely new.

The basis for Design A-150 was to build a ship that maintained the qualitative overmatch against the USN or RN that had been gained with the Yamato-class. The rationale for building the 70,000 tons full-load Yamato-class was the simple fact that the IJN could never compete on a qualitative basis with the USN, so it had to create ships with a qualitative edge. The Yamato-class with its extremely heavy level of protection and an 18.1in. main battery gave the IJN a clear qualitative edge.



Work on the new design, designated A-150, began in 1938–39 after design work on the Yamato-class was completed. Early work was built around the assumption that the new ships would carry 20.1in. guns (an upgrade from the 18.1in. main battery guns on the Yamato-class) in either three triple turrets or four twin turrets. Desired speed was 30kts to maintain an edge over the USN's North Carolina-class (then under construction) with its speed of 27kts. Protection was assumedly on a greater scale than that on the Yamato-class, which was designed to withstand 18in. shells. To build a ship with these capabilities, early studies

indicated that some 90,000-ton standard displacement was required. This was too grandiose and expensive even for the IJN, so it was decided that the ship would have to have a displacement equal to that of the Yamato-class. The final A-150 design was completed in early 1941. Construction prewar never began because of the low priority of battleships, and the early battles of the Pacific War demonstrated that the day of the battleship was over, which meant construction was never started after the war had begun.

Protection

Few details have survived on the protection scheme of Design A-150. Apparently, the main belt was slated to have a maximum thickness of 18in., and the main battery turret armor was increased to 31.5in. in front and 11.6in. on top. No other details are known. The immense armor thickness for the fronts of the 20.1in. turrets exceeded the ability of Japanese industry to produce, so that two separate layers would have to be produced instead. This was considerably less effective than a single plate.

Protection of the Yamato-class gives some clues to the level of protection planned for Design A-150. The Yamato-class was the most heavily armored warship ever built, with 33% (22,534 tons) of the design displacement devoted to armor. This was required to achieve the design requirements of withstanding 18in. shellfire and having underwater protection capable of defeating a torpedo warhead of 660lb of TNT. If Design A-150 was restricted to the same displacement of the Yamato-class, it is likely that the scale of armor fitted on the Yamatos would have been repeated, perhaps with some minor refinements. For example, on the Yamato-class the joint between the upper and lower armor belts employed a defective design using two different types of rivets. This lacked transverse strength against the shearing effects of an explosion. When it failed, the integrity of the armored citadel was compromised. The Japanese were aware of this defect, but since developing a new design would have delayed the ships' completion, they did not correct it. Underwater protection on the Yamato-class was defective, as was demonstrated during the war when both *Yamato* and *Musashi* (and the third ship, *Shinano*, that was converted into a carrier) were all lost to torpedo attack. The maximum depth (16.4ft amidships) of the anti-torpedo bulges fitted to the *Yamato* was below that of other foreign battleships designed during the same period. In addition, the bulge was not filled with some type of liquid to help absorb the force of an explosion. This meant the main belt facing the inside of the bulge was exposed to most of the blast. The unarmored bow and stern areas depended on compartmentation only. However, compartmentation on these areas was too large and the pumping system was inadequate. This translated into excessive flooding and a list.

Some refinements were planned in the protection scheme of the third and fourth Yamato-class units which presumably would have been incorporated into Design A-150. Additional bottom protection was required to combat the threat of mines, and in particular, magnetic mines. Accordingly, in the area of the machinery and magazine spaces, another layer of steel, one-half thick, was added to make a triple bottom. Where it was not possible to add this third layer, the double bottom was reinforced. Reinforcement of the bottom protection cost 600 tons in additional weight. To compensate for this, some other areas of protection, judged to have extra armor beyond what was required, were slightly reduced. This trimmed about ½in. from

Probably the most famous battleship ever built was the IJN's *Yamato*, shown here running trials on October 30, 1941. Her combination of 18.1in. guns and the heaviest level of protection possible made her the most powerful battleship ever completed. *Yamato*'s design was far from perfect, but it was used as the basis for Design A-150, the IJN's next generation of super-battleships. Had some of the super-battleships in this book been completed, they would have rivaled *Yamato* in firepower and protection. (Naval History and Heritage Command)

the main belt and the main armor deck, and about 1in. from the barbettes.

Whether or not Design A-150 would have corrected some of the protection issues associated with the Yamato-class, the newer design would still probably have been vulnerable to underwater attack since the USN's standard aerial torpedo (the Mark 13, Mod 1) carried a warhead of 606lb of Torpex, which was twice as powerful as TNT, making all the calculations of Japanese designers obsolete. In addition, the massive scale of protection to the IJN's latest battleships was undermined by the inferior quality of Japanese plate armor. Any ship as large and as heavily armored as the *Yamato* or Design A-150 would have been difficult to sink, but the total effectiveness of their armor protection was less than it should have been.

Possible Design A-150 armor (mostly based on that fitted on the Yamato-class)	
Belt	18in.
Bulkheads	11.8in.
Horizontal armor	7.7–8.9in.
Turret barbettes	21.2in. on the front
Main battery turrets	31.5in. frontal, 11.6in. top, 10in. side, 9.5in. rear
Conning tower	19.7in.

Propulsion

Again, few details exist. Assumedly, the propulsion plant would have been based on *Yamato*'s, which employed 12 steam boilers driving four turbines. This system developed 150,000shp, which was adequate to make 27.5kts. The steam turbine system was reliable but was also a relatively low-power design. One of the weaknesses was its very high use rate of fuel. For a navy as strapped for fuel as the IJN, this was a serious issue.

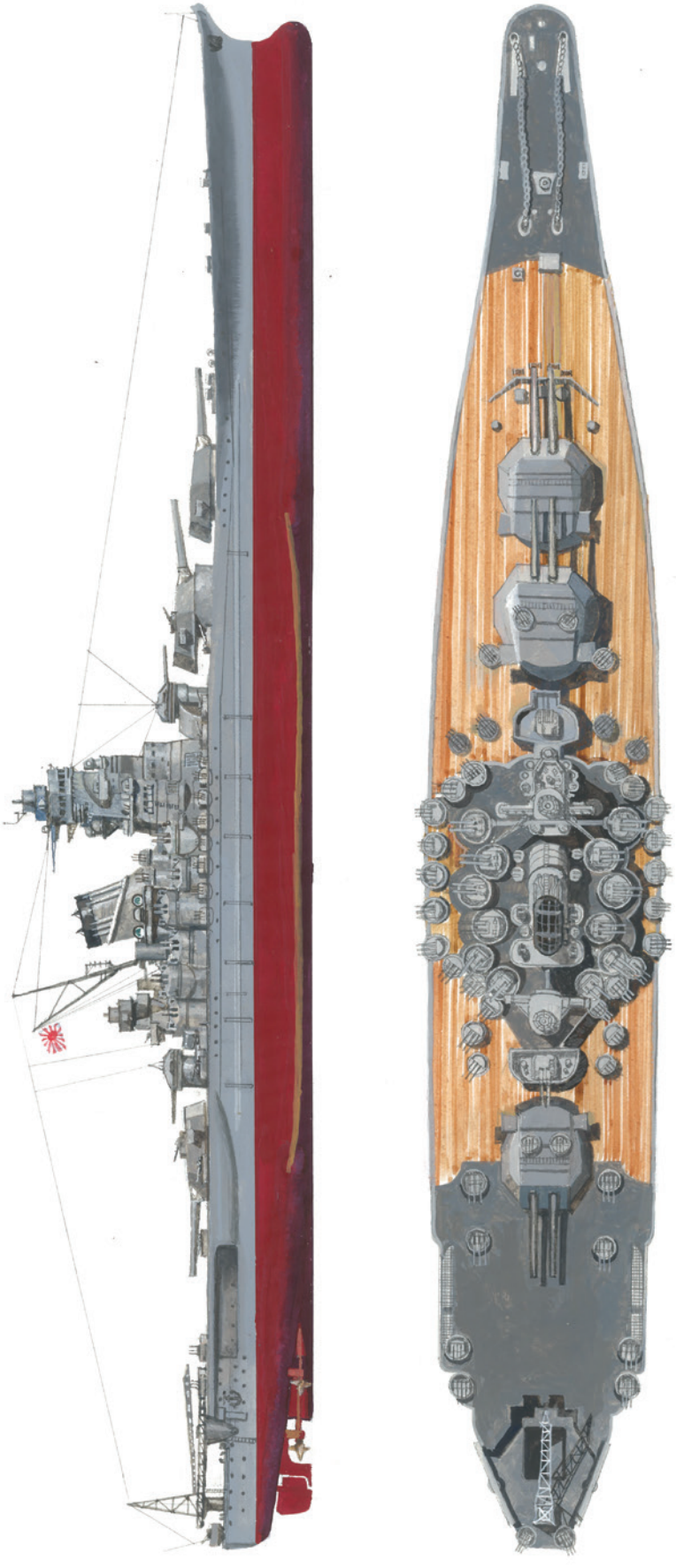
Armament

The 18.1in. guns on the Yamato-class super-battleships were designed to outrange the main battery of any American or British battleship. The Japanese expected the Americans to discover the true capabilities of the Yamato-class during the war, so the follow-on to the Yamato-class had to have even larger main battery guns to maintain the IJN's ability to outrange an enemy. Accordingly, the main battery for the new class was to consist of a new-design 20.1in./45 gun. The final version of Design A-150 called

G

DESIGN A-150

These speculative views depict a Design A-150 super-battleship. Since no plans survived of the design, this is an educated guess of what the ships might have looked like. The basic assumption in building these views is that their appearance would have been close to that of the Yamato-class. However, there would have been some important differences. First and foremost, the main battery is different with three twin 20.1in. turrets. To compensate for the heavier main battery, the two triple 6.1in./60 gun turrets present on *Yamato* have been removed and replaced with 3.9in./65 mounts. The other major change is the substitution of 3.9in./65 enclosed mounts for *Yamato*'s 5in./40 mounts. The number of twin 3.9in./65 mounts is unclear; these views reflect a total of 14, which it totally speculative. The placement of the large number of triple 25mm mounts is also speculative and reflects what the *Yamato* carried in 1945.



for a main battery of six of these guns in three twin turrets. Of note, the twin 20.1in. turrets were the same size as the triple 18.1in. turrets on the Yamato-class. Therefore, had the larger diameter guns proved troublesome, they could have been replaced with the proven 18.1in. turrets.

Little is known about these guns, which had they been mounted on the A-150 ships, would have been the largest ever placed on a warship. The IJN's Technical Department was already examining the new gun in June 1939 after the design for the 18.1in. gun was completed. One barrel for the 20.1in. gun was completed at Kure Navy Yard, and a second one was nearly finished. However, no trial firings took place, since the gun carriage and other fittings were never completed. The range of the new gun is unknown, but assumedly it would have been greater than the 45,275yds of the *Yamato*'s 18.1in./45 gun. Shell weight for the 18.1in./45 gun was 3,219lb. The size of the 20.1in. armor-piercing shell would have been 4,290lb.

Details of the secondary battery are also unclear. The primary gun would have been the excellent 3.9in./65. The IJN considered this to be its best dual-purpose gun with a maximum range against surface targets of 21,300yds. However, its high muzzle velocity led to a shortened barrel life. The number of weapons planned for Design A-150 is unknown but based on the secondary battery of the Yamato-class, at least 24 3.9in./65 guns in twin turrets could have been fitted. It is unknown if Design A-150 retained the two triple turrets with 6.1in./60 guns fitted aboard the Yamato-class. Though supposedly dual-purpose weapons, they proved ineffective in the antiaircraft role. It is very possible these would have been deleted to compensate for the greater weight of the 20.1in. turrets. By necessity, the number of the IJN standard light antiaircraft guns fitted on Design A-150 would have been huge. Up to 152 were fitted on *Yamato* by 1945.

Fate

Building two huge battleships after the beginning of the war was clearly beyond the means of Japan's shipbuilding industry. The Yamato-class program started before the war but was never completed. The two lead ships, *Yamato* and *Musashi*, were completed as battleships, and the third ship, *Shinano*, was not finished until late 1944 as an aircraft carrier. The fourth ship, never named and designated as Warship Number 111, was laid down in Kure Navy Yard in November 1940. By December 1941, the hull was about 30% complete. At this point, it was determined that there were other ships (aircraft carriers, submarines, destroyers) that were of higher priority, so construction of Warship Number 111 was canceled and the hull scrapped.

H

A JAPANESE DESIGN A-150-CLASS SUPER-BATTLESHIP IN ACTION

In this scene, the IJN's Design A-150 super-battleship is shown in action against an unseen USN battleship. Design A-150 was built around its immense main battery of 20.1in. guns – these are highlighted in this view. All three twin turrets are trained to port and have been elevated in preparation for firing a salvo at an American target. The IJN wanted this ship to maintain the qualitative overmatch against USN battleships that the Yamato-class had achieved by virtue of its 18.1in. main battery and immense level of protection. IJN doctrine for a gunnery action was built around the assumption that the main battery on its battleships would outrange the enemy's main battery. This was certainly true for the Yamato-class against any USN battleship fitted with 16in. guns, and the Japanese expected to retain this advantage by placing 20.1in. guns in its next class of super-battleships. Japanese battleship fire control systems were built around excellent optical rangefinders. Even without the use of radar, the Japanese expected to engage targets out to as far as 45,000yds. However, in a duel against a USN ship equipped with radar-guided fire control for its main battery, this tactic would have been ill-advised.

Like other major navies, the IJN resisted the idea of stopping all battleship construction. The Fifth Fleet Replenishment Program of 1942 included five capital ships. One of these was an improved Yamato-class, two were battle cruisers (known as Design B-65), and the last two were Design A-150 super-battleships. None of these were ever laid down.

Planned A-150-class construction		
Name	**Laid down**	**Built by**
Never named (designated Warship Number 798)	Never	Yokosuka Navy Yard
Never named (designated Warship Number 799)	Never	Kure Navy Yard

Had construction begun, the ships would have been laid down in late 1941 or early 1942. Planned construction time was three years before launch, with a total build period of five years.

A-150-class specifications	
Displacement	Approximately 70,000 tons full load
Dimensions	Unknown (estimated length 863ft, beam 128ft)
Machinery	Unknown
Performance	30kts desired
Range	Unknown
Crew	Unknown

The Soviet Navy – the Sovetsky Soyuz-class

Origins

Part of Stalin's grand design for building up the Soviet Union's military capabilities was to strengthen the navy. This vision featured a sea-going and "oceanic" navy to act as a deterrent during uncertain times and as a symbol of Soviet greatness. Accordingly, a number of grandiose naval plans were submitted in the 1930s, which included the construction of large battleships. The prospects for completing such a program were undermined by the state of Soviet industry and then by the Great Purge, which began to hit the navy's leadership in mid-1937. The ship design bureaus were also hit hard by the purges. This directly affected the ability of the Soviet Navy to build large and advanced battleships comparable to anything being contemplated in the West.

A naval program approved in June 1936 included provisions for eight "Type A" 35,000-ton battleships and 16 "Type B" battleships of 26,000 tons. In 1937, the displacement of the Type A ships had risen to 55,000–57,000 tons in accordance with the navy's desires. This plan was thrown into jeopardy when the Soviet government signed an agreement in July 1937 with the United Kingdom to abide by the tonnage limit from the Second London Conference of 35,000 tons for battleships. This agreement was updated in July 1938 with an agreement to emulate the escalator clause in the Second London Treaty, raising the battleship limit to 45,000 tons. Even this new limit was ignored by Soviet designers.

Amid the uncertainty of the purges, an unsettled international environment, and the difficulty of ascertaining Stalin's wishes, the Soviet Navy pressed on with getting a naval program approved. A new plan in 1937 called for only six Type A and 12 Type B ships. The following year, another program deleted the Type B battleships and raised the number of heavier

Type As from six to 15. This was reduced in 1939 and confirmed in 1940 as six battleships, all to be laid down by December 1942. Even this plan was modified again following the fall of France, after which large battleships seemed like an unnecessary luxury. In October, laying down any more battleships was stopped in favor of submarine and destroyer construction. Work on *Sovetskaia Belorussiia* was stopped, but construction on the other three struggled ahead. This included *Sovetskaia Rossiia* being built near Arkhangelsk, *Sovetskii Soiuz* in Leningrad, and *Sovetskaia Ukraina* at Nikolaev. All three were slated for launch in 1943.

Soviet warship designers had no experience with battleships. In the 1930s, the only battleships in Soviet Navy service were three of the four ships of the Gangut-class, laid down in 1909 and completed in 1914. This is *Oktiabrskaia Revoliutsiia* in 1936. Though modernized in the 1930s, the ships possessed weak protection, a main battery of 12in./52 guns, and a top speed of only 23kts. They were not suitable as a point of departure for the Sovetsky Soyuz-class of super-battleships. (Naval History and Heritage Command)

Design work for the new battleships was performed by the design bureau KB-4 located in Leningrad. The Main Naval Staff set the requirements for the design bureau to meet. Once the sketch designs were approved, the shipbuilding administration began work on the technical design. This process was prolonged by constant revisions between the navy and the shipbuilding administration created by unrealistic expectations by the navy. This problem was dealt with bureaucratically after the navy was silenced when its preliminary design capability office was folded under one of the wings of the shipbuilding administration. As difficult as this process turned out to be, it was made worse by political interference. This occurred at the highest level, since Stalin constantly meddled in the design of these ships. He went as far as to rewrite design requirements, often scuttling months of work.

Foreign assistance to the Soviet battleship program

The Soviet design process for super-battleships was aided indirectly by foreign assistance. From 1925, warship design and construction assistance was provided by Italy. In 1935, this took the form of Italian assistance on a battleship design. The design provided by the Italians was based on the Vittorio Veneto-class with the incorporation of some Soviet design ideas. The Soviets never intended to build the Italian design that they received in July 1936, but some technical data was incorporated into their domestic designs.

More effort was put into obtaining American technical assistance. This included the formation of a well-funded company in the United States to acquire equipment for the new battleships. The director of this company was totally ignorant of naval issues, but he was the son-in-law of Foreign Minister V. M. Molotov. This effort was further impeded by the antipathy of the USN over rendering any real assistance to the Soviets. Whatever the USN thought about Soviet desires for American assistance, President Roosevelt thought it was a good idea, so Soviet efforts gained some traction. They were prepared to contract with an American shipyard to build a 35,000-ton battleship with 16in. guns, with component parts provided for an additional battleship (or more) to be built in the Soviet Union. The yard approached by the Soviets was the New York Shipbuilding and Bethlehem Shipbuilding Corporation. It failed to get official approval from the State Department and called the deal off in May 1937. After this rebuff, the Soviets approached the USN to get its approval. Despite the eagerness of New York Shipbuilding to get the work, the deal again foundered.

More interesting was the Soviet approach to the famed naval architecture firm of Gibbs & Cox in August 1937. The resulting design produced by William Francis Gibbs was a 62,000-ton hybrid battleship/aircraft carrier. This design was not shown to the Soviets when it was first completed and was initially not approved by the State Department since it was in violation of all existing naval treaties. Meanwhile, the Soviet government changed its requirements to a ship of 45,000 tons. Stalin inserted himself into the equation by meeting with the US ambassador on June 5, 1938 to urge the Americans to approve the project. Roosevelt approved the construction of a 45,000-ton battleship in the US for the Soviets and also approved the release of the 62,000-ton monster battleship design to the Soviets.

Gibbs got to work designing the 45,000-ton battleship and met with a Soviet delegation during March–May 1939, but again faced delays at the hands of the USN. In any event, Soviet interest had shifted to destroyer designs. After the Soviet invasion of Poland in September, Gibbs informed the Soviets that he would have nothing more to do with them.

Two design bureaus submitted sketch designs for Battleship A in November 1936. The design from the KB-4 bureau was selected and became the starting point for the Sovetsky Soyuz-class. Even at this early point, the design exceeded the 45,000-ton limit, being 46,000–47,000 tons. The first detailed design by KB-4 came in at 48,415 tons. The navy objected and by April 1937 a technical design was produced for a 47,700-ton battleship. All concerned had already concluded that a much larger ship of some 55,000 tons would be needed to satisfy the navy's requirements. In July 1937, Stalin agreed to a new design of 55,000–57,000 tons with a main battery of nine 16in. guns, almost 15in. of armor on the main belt, and a top speed of 29kts. This was a major change requiring a massive redesign, and came just as the purges were reaching the navy and the design bureaus. In spite of these challenges, the remaining designers finished a design in November 1937.

By February 1938, the design had grown to 58,420 tons, with the same main battery and speed. Though the design was not complete in all respects, most importantly lacking machinery details, it was decided to lay down the first ship in July 1938 to this design. The technical plans were only approved in July. Construction began in early 1939 but proceeded very slowly, as described below.

Protection

The planned scale of protection for the new class was enormous. Design requirements were to withstand 16in. shells and 1,100lb bombs. In fact, the total weight of armor exceeded that of the IJN's Yamato-class. But the protection was less impressive than it seemed. The works providing the armor could not provide plates thicker than 230mm. In November 1940, it was decided to replace the cemented plate with face-hardened plate for areas greater than 8in. This was a significant decrease in protection since Soviet non-cemented plate proved to be much more brittle during tests.

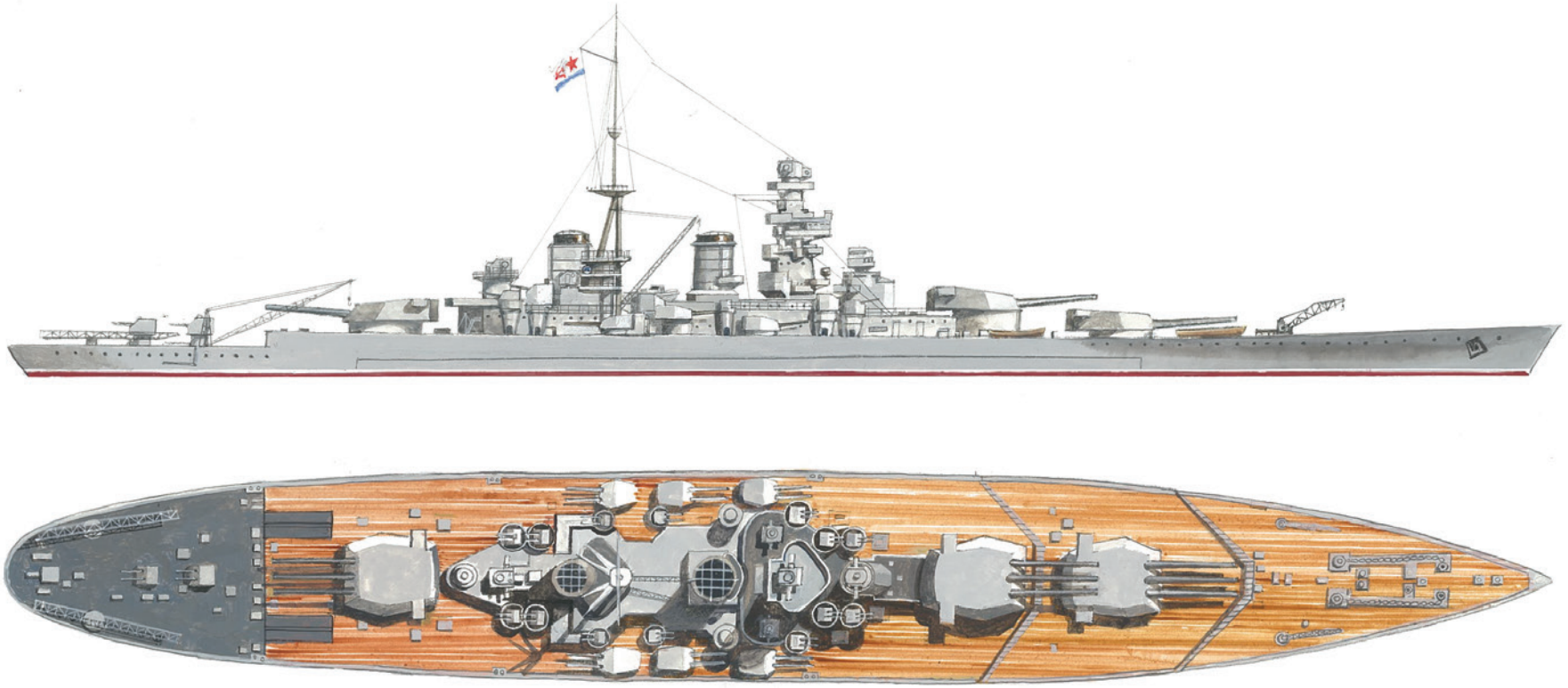
The main belt, which extended for 57% of the waterline length, covered the citadel with heavy protection that was 16.5in. at its thickest over the magazines. This thinned to just under 15in. over the machinery spaces. Above the main belt was a 25mm splinter belt extending the entire length of the citadel. Armor was provided for the entire length of the ship, not just over the armored citadel. Toward the bow, the main belt started at 8.7in. and thinned to less than an inch in a splinter belt extending to the bow. Aft, it thinned from 15in. to 7.1in.

Soviet designers had problems with providing the ships with adequate horizontal protection. Tests in 1937 in the Black Sea on a steamer fitted with

I

THE SOVETSKY SOYUZ-CLASS

A gigantic Sovetsky Soyuz-class super-battleship is depicted in these views. The ship projects a powerful overall image with its three large triple 16in. gun turrets and two massive stacks. The forward superstructure is squat and compact. The mainmast is placed amidships between the two stacks. Unlike the other super-battleships of the period, the hull is not flush. The arrangement of the secondary battery was not optimal. For surface action, 12 6in./57 guns were fitted in six twin turrets, which were all clustered amidships. The long-range antiaircraft battery was comprised of 12 3.9in./56 guns in six twin turrets; two of these were placed on the quarterdeck in the middle of the aircraft facilities. Also evident is the light antiaircraft battery comprised of 40 37mm/67.5 guns in ten mounts placed around the forward and aft superstructures. These mounts were completely enclosed to protect the crew from bomb splinters and the blast of larger guns. The quarterdeck was used for the aviation facilities. Two catapults were eventually planned. The aircraft crane and the hangar can also be seen.



Of the four Sovetsky Soyuz-class super-battleships, only *Sovetskii Soiuz* was assigned to the Ordzhonikidze Yard in Leningrad. Work was begun on the ship in January 1939 after the pretense of her keel being laid in the previous July to please Stalin. The Soviets soon ran into myriad industrial problems on the ship. Following the German invasion in June 1941, work was stopped on July 10, 1941 and the hull placed in long-term conservation. This German aerial reconnaissance photograph of the uncompleted *Sovetskii Soiuz* was taken on March 28, 1942. Surprisingly, the hull was virtually undamaged during the siege of Leningrad. (Naval History and Heritage Command)

various deck armor arrangements indicated that the main armor deck should be placed higher up in the hull with a splinter deck below. This created weight problems since it required the main armor belt to also be extended up the hull. Horizontal protection was provided in the form of three separate layers over the citadel. A forecastle deck of an inch thick was designed to explode bombs or shells before hitting the upper (main) deck of 6.1in. of armor. The final layer, the splinter deck, was comprised of 2in. of armor. Areas forward of the citadel received 2.6–4in., and areas aft were provided with 6.1–2.6in.

Underwater protection was designed to defeat an explosion by a warhead with the equivalent of 1,650lb of TNT. Extensive tests on scale models and a full-size caisson were conducted to determine the best underwater protection system. These were not completed until the autumn of 1939 and indicated that the American system of multiple torpedo bulkheads was superior to the Italian Pugliese system. The result was a hybrid with the Pugliese system used forward for just over 400ft and the multiple torpedo bulkhead system for another 108ft. Depth of the system was 26ft amidships and 22ft fore and aft.

Sovetsky Soyuz-class armor	
Belt	16.5in. maximum inclined at 5 degrees
Bulkheads	9in. forward; 7.1in. aft
Horizontal armor	1in. forecastle deck, 6.1in. upper deck, 2in. middle deck
Turret barbettes	16.7in.
Main battery turrets	19.5in. frontal, 9in. top, 9in. side, 16.1in. rear
Conning tower	16.7in.

Propulsion

A three-shaft plant was selected in order to reduce the length of the armored citadel and thus save weight. This arrangement affected the overall efficiency of the propulsion system. Major issues were experienced getting the domestically produced turbines completed, with the result that not a single turbine was completed. Only three turbines from Switzerland arrived. The first boiler, also to a Swiss design, was not completed until early 1941.

The machinery layout was not optimal. Four boilers were placed in two boiler rooms forward with the three turbines in a single compartment abaft them. While presumably there were bulkheads separating the turbines, locating all of them in a single compartment was a potential weakness. The other two boilers were placed in a single compartment abaft the machinery compartment.

Armament

The main battery was comprised of nine 16in./50 guns in three triple turrets. The 16in. guns were of a new design and successfully passed tests in 1940. Each turret had a 39ft rangefinder and provision for use on local control. The central fire control system employed two 26ft stereoscopic rangefinders. One scope measured target range and the other measured the fall of the ship's own shells. An electro-mechanical computer was provided for calculating range and azimuth.

The number and placement of the secondary battery was the subject of much work because of a desire to remain clear of the blast of the main battery and the magazine placement. The archaic arrangement of a separate battery for anti-surface work and another battery of heavy antiaircraft guns was adopted. The anti-surface secondary battery of 12 6in./57 guns in six twin turrets was clustered amidships. Long-range antiaircraft protection was provided by eight 3.9in./56 guns in four twin turrets. After the navy complained, this was increased to 12 guns in six twin turrets in January 1941, with the addition of the two turrets on the quarterdeck. These were controlled by three stabilized directors. The light antiaircraft battery was comprised of 32 37mm/67.5 guns in eight mounts. The navy found this to be inadequate and it was augmented to 40 guns in 1941. Of note, these mounts were completely enclosed to protect the crew from bomb splinters and the blast of larger guns.

Aviation facilities were situated on the quarterdeck and originally included a single catapult. This was increased to two catapults in January 1941. There was room to store two KOR-2 flying boats in two hangars. Two others sat on the catapult or on deck.

Fate

Given the state of the Soviet shipbuilding industry at the time and the size and complexity of the Sovetsky Soyuz-class, there was no real danger that these ships would ever be completed. Armor production was insufficient, and much of the armor that was finished was rejected by the shipyards because of poor quality. Machinery also proved hard to complete; not a single turbine unit was ever completed from the design provided by the Swiss. There were also problems with fabrication of the propeller shafts and the main gun turrets. Shipyards had problems instituting welding, which meant these ships were still built mainly with rivets.

The four ships laid down were to be completed in 1939 and enter fleet service in 1941. There was never a chance that this schedule could be achieved. The lead ship, *Sovetskii Soiuz*, was ostensibly laid down in July 1938 to placate Stalin. Real work did not begin until January 1939. It proved impossible to build two ships at Leningrad and two at Nikolaev as originally intended, so two ships were shifted to the new shipyard at Molotovsk near Arkhangelsk. Parts for these two ships were built at Leningrad and then shipped north to the new facility.

Planned Sovetsky Soyuz-class construction

Name	Laid down	Built by
Sovetskii Souiz (Soviet Union)	July 31, 1938	Ordzhonikidze Yard, Leningrad
Sovetskaia Ukraina (Soviet Ukraine)	October 31, 1938	Marti Yard, Nikolaev
Sovetskaia Rossiia (Soviet Russia)	July 22, 1940	Molotovsk Yard
Sovetskaia Belorussiia (Soviet Belorussia)	December 21, 1939	Molotovsk Yard

In August 1939, the construction period was estimated to be 60 months. This meant *Sovetskii Souiz* and *Sovetskaia Ukraina* were scheduled to launch in May–June 1941 and enter service in 1943. *Sovetskaia Belorussiia* would follow in 1944. For reasons already mentioned, construction quickly fell behind and the entire program seemed in doubt. On October 19, 1940, construction of *Sovetskaia Belorussiia* was canceled after it was found

A USN naval attaché took this photograph of *Sovetskii Soiuz* in June 1944 at the Ordzhonikidze Yard in Leningrad. Her hull looks intact; at the start of the war, her hull was estimated to be 21% complete with 15,818 tons of steel in place, including 4,287 tons of armor. Little damage was done to the hull during the war, but some armor was used for various fortifications in the defense of Leningrad, bringing the state of completion down to 19.5%. At this point, she was by far the most advanced in terms of completion of the Soviet super-battleships, which prompted interest in possibly finishing the ship after the war. (Naval History and Heritage Command)

that the 70,000 rivets in her bottom had been made from inferior steel. Canceling one ship at Molotovsk meant the other, *Sovetskaia Rossiia*, could be finished earlier (1943 instead of 1944). When the Germans invaded the Soviet Union in June 1941, none of the three ships remaining were more than 20% completed. As it was obvious that none were going to be completed in time to help the fight against the Germans, on July 10, 1941 work was halted on the other three ships. Aside from *Sovetskii Soiuz*, which was placed in long-term conservation, the other ships were canceled on September 10, 1941.

After the war, a special commission was created to ascertain if there were any prospects of completing any of the hulls. Stalin believed that one of the ships should be completed. Though the *Sovetskaia Ukraina* at Nikolaev had reached 18% completion by the start of the war, parts of the hull had been dismantled by the Germans when they occupied the city. Before evacuating Nikolaev, the Germans blew up the supporting blocks under one side of the hull, making launching impossible. *Sovetskaia Rossiia* in the Molotovsk Yard was not even 1% complete. The most promising way to get any of the battleships completed was resuming construction of *Sovetskii Soiuz* in Leningrad. After war damage and having had some of her armor used in fortifications around Leningrad, the ship was still 19.5% complete. Three Swiss-supplied turbines were available to be fitted. However, the commission noted the unfinished ships had severe weaknesses and would have been inferior to other foreign designs. Correcting these design deficiencies would have taken up to three years, and then to finish construction would have tied up valuable shipyard resources better spent on more modern ships. Accordingly, the commission recommended scrapping *Sovetskaia Ukraina* and *Sovetskaia Rossiia*, but steered away from recommending the same fate for *Sovetskii Soiuz* for fear of provoking Stalin. In March 1947, it was directed that the first two ships be scrapped. *Sovetskii Soiuz* survived until May 1948 when she was also directed to be scrapped. The Soviet quest for a super-battleship was finally over.

Sovetsky Soyuz-class specifications (1939 design)	
Displacement	59,150 tons standard; 65,150 tons full load
Dimensions	Length 883ft, 11in.; beam 127ft, 8in.; draft 34ft, 1in.
Machinery	Six boilers driving three geared steam turbines on three shafts making 210,000shp (231,000shp forced) making 27.5kts (28.5kts forced)
Performance	28.25kts
Range	5,280 tons of fuel for 6,300nm at 14.5kts
Crew	1,664

ANALYSIS AND CONCLUSION

The USN considered the Iowa-class an inferior design compared to the Montana-class. Given significantly more tonnage to work with, American designers came up with the much more balanced and powerful Montana-class. These ships possessed much superior protection – only they could stand up to the 16in./50 and its 2,700lb shell, considered the finest naval gun

in the world by the USN. *Montana* was the most powerfully armed warship ever planned, with a broadside greater than any other battleship. The real firepower edge possessed by this class would have been their superior fire

The Battle off Honshu, 1946

The greatest ever clash of battleships took place on March 15, 1946. This titanic duel pitted the USN's *Montana* against the IJN's super-*Yamato* based on Design A-150. After Japan failed to surrender following several atomic bomb attacks, the Americans decided to proceed with Operation *Coronet*, the invasion of Honshu. By this point, the IJN was little more than a collection of suicide platforms with one exception. Construction of super-*Yamato*, begun in 1942, had struggled forward and after tremendous effort, the ship was completed before the expected American invasion. The super-battleship was moved to Yokosuka to defend the seaward approaches to Tokyo. Construction of super-*Yamato* did not go unnoticed by the Americans. In order to counter this threat, construction of two Montana-class units had been approved. By the start of the invasion of Japan, *Montana* was in service and with a crew eager to come to grips with her large Japanese adversary, which was rumored to be ready.

When the American invasion force was spotted, super-*Yamato* prepared to leave Yokosuka with a small number of escorting destroyers to strike the invasion fleet landing west of Tokyo Bay. Fortunately for the Japanese, the weather was extremely bad, and heavily overcast which prevented the intervention of the USN's immense carrier task force. In response to the IJN's bid to attack the invasion fleet, the Americans decided to engage the threat with *Montana* and a large force of destroyers. All other battleships were withheld since it was believed that super-*Yamato* mounted extraordinarily large guns, perhaps as big as 20in.

Remarkably, the small Japanese force evaded all the American submarines waiting for it off Tokyo Bay and headed directly for the invasion area to the west. *Montana* moved to intervene. The battle began at dusk. American destroyers gained first radar contact on super-*Yamato*, and soon *Montana* gained contact at almost 40,000yds range. In February 1944, off Truk Atoll, two Iowa-class battleships had engaged targets at up to 39,000yds – the longest surface engagement range of the war so far. On this day, the Mark 8 radar on *Montana* performed up to expectations and fire was opened at 39,500yds. *Montana* fired deliberate salvos at the Japanese super-battleship while maneuvering the range down to about 32,000yds – believed to be at the edge of *Montana*'s immunity zone. The American admiral in command was content to fight the engagement at long range to take advantage of his superior fire control system. As it grew darker, visual contact was lost on the Japanese ship, but radar indicated that the target had been consistently straddled with a few possible hits.

On board super-*Yamato*, the Japanese admiral in command was suffering from extreme frustration. His ship was being pummeled by heavy American shells – one hit the ship on the port bow and opened a large hole. Heavy flooding and a brief list resulted before counterflooding brought the ship back to an even keel. Other possible hits or very near misses were reported on the port beam that caused more minor flooding. Smaller ships, assumed to be American destroyers, closed inside 20,000yds and were engaged by the ship's secondary battery. For the first time in naval history, 20.1in. guns were used in anger. However, the few half-salvos sent toward the American battleship seemed to have no effect.

After almost an hour of deliberate firing, the USN also had cause for frustration. Even after firing some 320 16in. shells at the Japanese behemoth, it appeared unaffected. With the Japanese threat approaching the invasion area, the battle had to be fought decisively. The admiral ordered *Montana* to within 22,000yds of the Japanese ship. This was a risk but was still thought to be within *Montana*'s immunity zone. From this range, intensive fire would be opened and a massed torpedo attack from 21 destroyers conducted. As *Montana* moved closer, gunners aboard super-*Yamato* were able to get a better fire control solution in the dark using their optical rangefinders. Even so, none of the Japanese salvos were close to their target. In comparison, the full salvos from *Montana* were finding their mark. Several hits were scored on super-*Yamato*'s superstructure, knocking out her radar and main rangefinders, but the ship's command personnel were untouched in the conning tower. Other hits on the hull, mostly outside the armored citadel, created more flooding and another list.

As the battleships rained fire upon each other, three USN destroyer squadrons continued to close their target. They brushed aside the three Japanese Matsu-class destroyers trying to protect *Super-Yamato* and lined up for a massed attack from both bows of the oncoming Japanese battleship. As radar on the destroyers tracked the speed of the target, it seemed to suddenly drop. Based on the number of splashes around the ship, it seemed almost certain this was a result of battle damage. In fact, two 16in. shells had penetrated super-*Yamato* in the area of Number 3 Turret and caused severe flooding in the aft engine room. Despite heavy fire from super-*Yamato*'s 3.9in. secondary guns that damaged three destroyers, none severely, as many as 16 destroyers gained radar-guided fire solutions for their torpedo batteries. Soon, 154 torpedoes were in the water headed for the Japanese ship. Hit by as many as 24 torpedoes (the Americans claimed 40, but the real number will never be known), the underwater defenses of super-*Yamato* were overwhelmed. Within 20 minutes, all power was lost, and a heavy port list developed which could not be corrected since the pumps could not operate. Some 40 minutes after being struck by the first torpedo, super-*Yamato* capsized. In return, no American destroyers were sunk, and *Montana* suffered only light splinter damage that killed two men and wounded 11 more.

control systems. The only compromise made by American designers was in the area of speed. All considered, the Montana-class was the best of all the uncompleted super-battleships.

Looking at the designs of the two major European navies, the RN's Lion-class was a good mix of firepower, protection, and speed. However, the ships' characteristics were not superlative in any area. As originally designed, the Lion-class had two real weaknesses. The 1942 redesign addressed both of these. The first was the weakness of the side protection system. Additional depth from the redesign partially addressed this problem, but the British decided to keep the maximum beam at 108ft to use the Panama Canal and thus did not achieve maximum anti-torpedo protection. The second problem, inadequate range, was addressed in the redesign by adding 1,100 tons of fuel to the ships' capacity. In any duel with an Axis opponent, the Lion-class would have benefitted from their excellent radar fire control.

Mainly because of its much larger size, which forced German designers to make fewer compromises, the H-39 design was a superior ship to the Lion-class. The H-39 possessed excellent firepower in the form of the 16in./50 gun. German guns were noted for their accuracy. However, the excellent performance of this gun would have been limited by the lack of radar-guided fire control. The Germans were able to compensate for this with excellent optics and well-trained crews, but this would have been a major weakness at night and in poor visibility. The secondary armament was anachronistic with its separate batteries for anti-surface and antiaircraft protection. German failure to develop a dual-purpose gun suitable for naval employment was noteworthy. Had these ships ever been completed, they would have entered service late in the war when a potential air threat would have been at its highest. This would have shown the weakness in the H- class's antiaircraft protection.

Protection of the H-39 design was novel compared to the other super-battleship designs in this book. The ship's main belt was thin in comparison to foreign designs and lacked depth. The provision of an even thinner upper belt added weight but gave no protection against main battery rounds and even 6in. guns at close range. Inadequate tests against the effects of bombs also resulted in inadequate horizontal protection. The two armored decks would have been unable to stop large bombs dropped from altitude. This was because the Germans decided to provide armor to other areas at the expense of horizontal protection to remain within displacement restrictions. Even the Germans realized this lack of horizontal protection was a bad idea and added a third armor deck on their last design studies. Underwater protection was also weak compared to foreign designs. It was based on that fitted to *Bismarck*, which had proven deficient against torpedoes and underwater damage from a British 14in. shell when *Bismarck* met her end in 1941. The subsequent H-41 design, with its emphasis on protection, addressed some of these weaknesses.

The later designs of the H-class – H-42, H-43, and H-44 – were pure fantasy and cannot be compared to ships which actually had a chance of completion. They are though an example of what can be accomplished on a battleship of unlimited size when trade-offs between firepower, protection, and speed do not have to be made.

Of all the never-completed super-battleships, the Sovetsky Soyuz-class was the least impressive. As the Soviets themselves assessed, the ships possessed significant weaknesses, including inadequate antiaircraft protection, no provision for radar, weak horizontal and underbottom protection, and

insufficient speed compared to modern foreign battleships. Though the ships would have mounted very long-range 16in. guns, giving them a theoretical advantage over foreign adversaries, this meant nothing since the range of the weapon far outstripped the range of the optical fire control system on board. The lack of radar for fire control of the main battery or the antiaircraft battery would have placed them at a severe disadvantage against any of the other super-battleships.

The A-150 is hard to assess since details on the ship's specifications are so sparse. It can be assumed that the scale of protection would have been similar to that of the Yamato-class since the two classes would have been similar in size. The greatest potential advantage of Design A-150 was her main battery of 20in. guns. However, the advantage between the 20in. gun and the USN's 16in./50 gun would probably not have been as great as might be assumed. The armor-piercing capabilities of the Japanese 18.1in./45 gun mounted on *Yamato* was mediocre for its size and was only slightly greater than the armor-piercing capabilities of the 16in./50 gun. At 21,872yds, the 18.1in. gun could penetrate 19.5in. of armor and from 32,808yds it could punch through 14.2in. of armor. This would have defeated *Montana*'s main belt. The penetrative powers of the 20in. gun are unknown, but with its heavier shell they would have been somewhat greater. The major factor inhibiting the capabilities of the 20in. gun was its mediocre fire control system. The four 49ft stereoscopic rangefinders on *Yamato*, the largest ever placed on a battleship, would have probably been repeated on the A-150. These were excellent optical equipment, but not as good as the radar-guided fire control equipment on an American battleship. IJN radars were vastly inferior – the Type 22 surface search radar was capable of greater surface target discrimination compared to the first IJN radar, the Type 21, but it did not possess the discrimination required for a true fire control radar. It only had a maximum range of 26,930yds against a battleship-sized target.

FURTHER READING

Breyer, Siegfried, *Battleships and Battle Cruisers 1905–1970*, Doubleday & Company Inc., Garden City, New York (1978)

Campbell, John, *Naval Weapons of World War Two*, Naval Institute Press, Annapolis, Maryland (1985)

Friedman, Norman, *U.S. Battleships*, Naval Institute Press, Annapolis, Maryland (1985)

Garzke, William H., and Dulin, Robert O., *Battleships, United States Battleships, 1935–1992*, Naval Institute Press, Annapolis, Maryland (1995)

Garzke, William H., and Dulin, Robert O., *Battleships, Axis and Neutral Battleships in World War II*, Naval Institute Press, Annapolis, Maryland (1985)

Garzke, William H., and Dulin, Robert O., *Battleships, Allied Battleships in World War II*, Naval Institute Press, Annapolis, Maryland (1980)

Lengerer, Hans and Ahlberg, Lars, *The Yamato Class and Subsequent Planning*, Nimble Books, Ann Arbor, Michigan (2014)

McLaughlin, Stephen, *Russian and Soviet Battleships*, Naval Institute Press, Annapolis, Maryland (2003)

Sturton, Ian (ed.), *Conway's Battleships*, Naval Institute Press, Annapolis (2008)

INDEX

Note: Page numbers in **bold** refer to illustrations and their captions.

aircraft facilities 16, **16**, **C(18–19)**, **D(24–25)**, **E1(28–29)**, 30, 43
all or nothing protection concept *5*
armament 9
  antiaircraft guns 16, **C(18–19)**, 21, **D(24–25)**, 30, 36, **I(40–41)**, 43
  Design A-150 32, 34, **G(34–35)**, 36, **H(36–37)**, 47
  H-39-class **9**, 24, **D(24–25)**, 28, 30, 46
  Iowa-class 8
  Lion-Class **17**, **C(18–19)**, 20–21
  Montana-class 10, **A(10–11)**, 12, 13, 16
  Sovetsky Soyuz-class **I(40–41)**
  Yamato-class **7**, 34, 36
armored citadel 5, 27, 33

belt armor 5–6, 18, 20, 26–27, 33, 40
Bismarck **5**, 22, **23**, 26, 27, **27**, 46

Conqueror, HMS 21

Design A-150 **32**, **G(34–35)**, 45
  antiaircraft protection 36
  armament 32, 34, **G(34–35)**, 36, **H(36–37)**, 47
  construction 36, 38
  fire control system 47
  main battery 34, **G(34–35)**, 36, **H(36–37)**, 47
  origins 32–33
  propulsion systems 34
  protection 33–34
  secondary battery **G(34–35)**, 36
  speed 32
Duke of York, HMS 18

face hardened armor 6
fire control system 8–9, **A(10–11)**, 42, 47
firepower 5, 8, **8**, 9
France, fall of 12

Gangut-class **39**
German Navy. *see also* H-class
  battleship designs 26
  super-battleship program 4–5
Gibbs & Cox 39

H-39-class 4–5, **D(24–25)**
  aircraft facilities **D(24–25)**, 30
  antiaircraft protection 24, 27, **D(24–25)**, 30
  armament **9**, 24, **D(24–25)**, 28, 30, 46
  endurance 28
  immunity zone 26
  main battery 24, **D(24–25)**, 28
  origins 22–24
  production 30, 32
  propulsion systems 7, 24, 27–28
  protection 24, 26–27, 46
  secondary battery **D(24–25)**, 28, 30
  specifications 32
  speed 23–24, 28
H-41 **E1(28–29)**, 30
H-42 **E2(28–29)**, 46
H-43 **F1(30–31)**, 46
H-44 **F2(30–31)**, 46
Hitler, Adolf **23**, 24, 26, 30
Honshu, Battle off, 1946 45
horizontal armor 6, 18, 24, 26, 27, 40, 42
Hosho **7**
Howe, HMS **18**

Illinois, USS 9
immunity zone 6, 12, 26
Imperial Japanese Navy. *see also*
  Design A-150; Yamato-class
  Fifth Fleet Replenishment Program 38
  super-battleship program *5*
Iowa, USS **5**, **8**, 9
Iowa-class 4, **5**, 8, **8**,9, 13, 44

Kentucky, USS 9
King George V-class 17–18, **17**, **18**, 20, 22

Lion, HMS 21, **21**
Lion-Class 4, **C(18–19)**, 46
  aircraft facilities **C(18–19)**
  antiaircraft protection **C(18–19)**, 21
  armament **17**, **C(18–19)**, 20–21
  construction 21–22
  main battery 18, **C(18–19)**, 20
  origins 17–18
  propulsion systems 20
  protection 18, 20, 46
  secondary battery 18, **C(18–19)**, 20–21
  specifications 22

Mamiya **7**
mines, threat of 33
Montana, USS **A(10–11)**, **B(14–15)**, 45, 47
Montana-class 4, **4**, **5**, **10**, **A(10–11)**, **12**, **13**, **B(14–15)**, 44–46
  antiaircraft protection 16
  armament 10, **A(10–11)**, 12, 13, 16
  aviation facilities 16, **16**
  cancellation 16–17
  fire control system **A(10–11)**
  hull numbers 9
  immunity zone 6, 12
  main battery 10, **A(10–11)**, 13
  origins 9–10, 12
  propulsion systems 10, 13
  protection 10, 12–13
  secondary battery 10, 13, 16
  specifications 17
  speed 10, 13
Musashi 33, 36

Oktiabrskaia Revoliutsiia **39**

Prince of Wales, HMS 17, **17**, 22
propulsion systems 18, 26
  Design A-150 34
  H-39-class 7, 24, 26, 27–28
  Lion-Class 20
  Montana-class 10, 13
  Sovetsky Soyuz-class 42
protection 5, 5–7, 7, 10, 12–13, 20, 26
  all or nothing concept *5*
  armored citadel 5, 27, 33
  belt armor 5–6, 18, 20, 26–27, 33, 40
  Design A-150 33–34, 36
  face hardened armor 6
  H-39-class 24, **D(24–25)**, 26–27, 30, 46
  homogenous armor 6
  horizontal armor 6, 18, 24, 26, 27, 40, 42
  Lion-Class 18, 20, 21, 46
  Montana-class 10, 12–13, 16
  side 7, 12–13, 20
  Sovetsky Soyuz-class 40, 42, 46–47
  torpedo 17, 18
  underbottom 7, 12, 26
  underwater 5, 7, 12, 20, 24, 27, 33, 42, 46
  Yamato-class 33, 34

radar 8–9, 47
Royal Navy 4 *see also* Lion-Class

Second London Naval Treaty 9, 10, 18, 38
Shinano **7**, 33, 36
side protection system 7, 12–13, 20
South Dakota-class 9
Sovetskaia Belorussiia 43–44
Sovetskaia Ukraina 43–44
Sovetskii Rossiia 44
Sovetskii Soiuz **42**, 43–44, **44**
Sovetsky Soyuz-class 5, **I(40–41)**, **42**
  aircraft facilities 43
  antiaircraft protection **I(40–41)**, 43
  armament **I(40–41)**, 42–43
  construction 43–44
  fire control system 42
  main battery **I(40–41)**, 42
  origins 38–40
  propulsion systems 42
  protection 40, 42, 46–47
  secondary battery **I(40–41)**, 42, 43
  specifications 44
Soviet Navy. *see also* Sovetsky Soyuz-class
  battleship program 38–40
  foreign assistance 39
  super-battleship program *5*
speed 5, 10, 13, 28
Stalin, Josef 38

Temeraire, HMS 21, 22
Thunderer, HMS 21
Tirpitz **9**, 22, 26, **26**
torpedo bulkheads 6, 7, 24, 27
torpedo protection 17, 18
Two-Ocean Navy Act 12

underbottom protection 7, 12, 26
underwater protection 5, 7, 12, 20, 24, 27, 33, 42, 46
US Navy **4**, **5**, 39, 44–45. *see also* Montana-class

Vanguard, HMS **21**, **22**
Vittorio Veneto-class 39

Yamato **7**, 33, **34**, 36, 47
Yamato-class 5, 12, 32, **32**, 36
  armament 7, 34, 36
  protection 7, 33, 34

OSPREY PUBLISHING
Bloomsbury Publishing Plc
Kemp House, Chawley Park, Cumnor Hill, Oxford OX2 9PH, UK
29 Earlsfort Terrace, Dublin 2, Ireland
1385 Broadway, 5th Floor, New York, NY 10018, USA
E-mail: info@ospreypublishing.com
www.ospreypublishing.com

OSPREY is a trademark of Osprey Publishing Ltd

First published in Great Britain in 2022
This electronic edition published in 2022 by Bloomsbury Publishing Plc

© Osprey Publishing Ltd, 2022

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage or retrieval system, without prior permission in writing from the publishers.

A catalog record for this book is available from the British Library.

ISBN: PB 9781472846723; eBook 9781472846730;
ePDF 9781472846709; XML 9781472846716

Index by Alan Rutter
Typeset by PDQ Digital Media Solutions, Bungay, UK

Osprey Publishing supports the Woodland Trust, the UK's leading woodland conservation charity.

To find out more about our authors and books visit **www.ospreypublishing.com**. Here you will find extracts, author interviews, details of forthcoming events and the option to sign up for our newsletter.